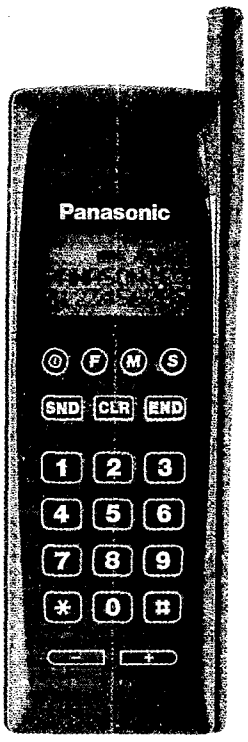
Order Number: MCUK940101C2

Service Manual

Personal Cellular Telephone

Handheld Unit

EB-3650
EB-3651
EB-3652
J Series



Panasonic

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Certificate No FM13397

MCUK-TSD-503 Iss Rev 0

WARNINGS AND CAUTION

1. The equipment described in this manual contains polarised capacitors utilising liquid electrolyte. These devices are entirely safe provided that neither a short-circuit nor a reverse polarity connection is made across the capacitor terminals. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT OR, AT WORST, POSSIBLE INJURY TO PERSONNEL RESULTING FROM ELECTRIC SHOCK OR THE AFFECTED CAPACITOR EXPLODING. EXTREME CARE MUST BE EXERCISED AT ALL TIMES WHEN HANDLING THESE DEVICES.
2. The equipment described in this manual contains electrostatic sensitive devices (ESDs). Damage can occur to these devices if the appropriate handling procedure is not adhered to.
3. **ESD Handling precautions**
   A working area where ESD sensitive devices may be safely handled without undue risk of damage from electrostatic discharge, must be available. The area must be equipped as follows:
   Working Surfaces - All working surfaces must have a dissipative bench mat, SAFE for use with live equipment, connected via a 1MΩ resistor (usually built into the lead) to a common ground point.
   Wrist Strap - A quick release skin contact device with a flexible cord, which has a built in safety resistor of between 5kΩ and 1MΩ shall be used. The flexible cord must be attached to a dissipative earth point.
   Containers - All containers and totage must be of the conductive type.

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Amendment Record

The information provided in this Service Manual is issued in March 1994. Amendments to this manual will be updated by the use of an Amendment Instruction Sheet, together with the amended sheet(s) for insertion into the manual. Carry out the amendment instructions and enter the appropriate details in the Amendment Record below.

Amendment Number	Amended by	Date

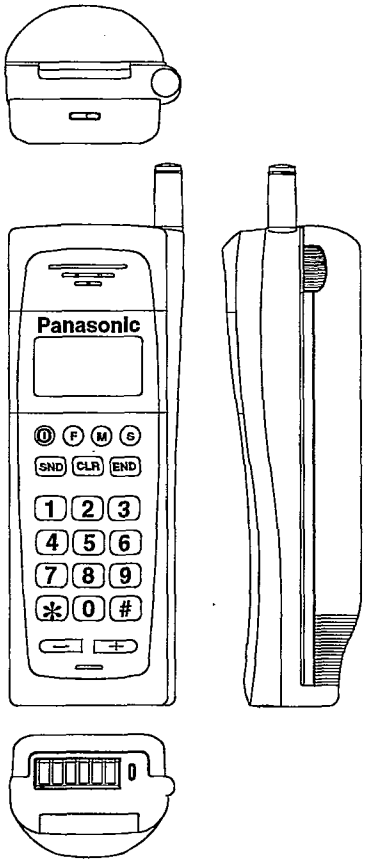
1 COMPOSITION

1.1 Kit Composition

Kit Number	Re-order Number	Kit Name	Kit Contents	
Main Kit			EB-3650	Main Unit (Panasonic U.K.)
EB-KJ3650	EB-KJ3650	Panasonic U.K.	EB-3652	Main Unit (British Telecom U.K.)
EB-KJ3652	EB-KJ3652	British Telecom U.K.	EB-3651	Main Unit (Vodac U.K.)
EB-KJ3651	EB-KJ3651	Vodac U.K.	EB-3650AT	Main Unit (Panasonic Austria)
EB-KJ3650AT	EB-KJ3650	Panasonic Austria	EB-3650IT	Main Unit (Panasonic Italy)
EB-KJ3650IT	EB-KJ3650	Panasonic Italy	EB-3650ES	Main Unit (Panasonic Spain)
EB-KJ3650ES	EB-KJ3650	Panasonic Spain	EB-P70020	900mAh Battery
			EB-P70022	Rapid Charger
			EB-P70024	AC Adapter (U.K.)
			EB-P70035	AC Adapter (Europe)
			EB-Z70126	Operating Instructions (Panasonic U.K.)
			BT953 2/94	Operating Instructions (British Telecom
			EB-Z70130	U.K.)
			EB-Z70129	Operating Instructions (Vodac U.K.)
			EB-Z70127	Operating Instructions (Panasonic Austria)
			EB-Z70128	Operating Instructions (Panasonic Italy)
			EB-Z70131	Operating Instructions (Panasonic Spain)
			BT954 2/94	Quick Reference (Panasonic U.K.)
			EB-Z70135	Quick Reference (British Telecom U.K.)
			EB-Z70134	Quick Reference (Vodac U.K.)
			EB-Z70132	Quick Reference (Panasonic Austria)
			EB-Z70133	Quick Reference (Panasonic Italy)
			EB-Z70100	Quick Reference (Panasonic Spain)
			EB-Z70175	Packing (Panasonic)
			EB-Z70107	Packing (British Telecom U.K.)
				Packing (Vodac U.K.)
Car Mount Kit			EB-J70004	Hands Free Cradle
EB-KJ0287		Panasonic	EB-N0001	Adjustable Angle Bracket
EB-KJ0319		British Telecom U.K.	EB-M1177	Microphone
EB-KJ0288		Vodac U.K.	EB-W70013	Power Supply Cable
			EB-Z70101	Packing (Panasonic)
			EB-Z70176	Packing (British Telecom U.K.)
			EB-Z70108	Packing (Vodac U.K.)
Headset Adapter Kit			EB-M70004	Earphone and Microphone
		Panasonic	EB-J70005	Headset Adaptor
EB-KJ0290		British Telecom U.K.	EB-Z70174	Packing (Panasonic)
EB-KJ0325		Vodac U.K.	EB-Z70194	Packing (British Telecom U.K.)
EB-KJ0291			EB-Z70188	Packing (Vodac U.K.)
Carry Case			EB-B70005	Carry Case
EB-B70005/P	EB-B70005	Panasonic	EB-Z70169	Packing (Panasonic)
EB-B70005/B		British Telecom U.K.	EB-Z70189	Packing (British Telecom U.K.)
EB-B70005/P		Vodac U.K.	EB-Z70183	Packing (Vodac U.K.)
900mAh Battery			EB-P70020	900mAh Battery
EB-P70020/P	EB-P70020	Panasonic	EB-Z70170	Packing (Panasonic)
EB-P70020/B		British Telecom U.K.	EB-Z70190	Packing (British Telecom U.K.)
EB-P70020/P		Vodac U.K.	EB-Z70184	Packing (Vodac U.K.)
600mAh Battery			EB-P70021	600mAh Battery
EB-P70021/P	EB-P70021	Panasonic	EB-Z70171	Packing (Panasonic)
EB-P70021/B		British Telecom U.K.	EB-Z70191	Packing (British Telecom U.K.)
EB-P70021/P		Vodac U.K.	EB-Z70185	Packing (Vodac U.K.)
Dry Battery Pack			EB-P70023	Dry Battery Pack
EB-P70023/P	EB-P70023	Panasonic	EB-Z70172	Packing (Panasonic)
EB-P70023/B		British Telecom U.K.	EB-Z70193	Packing (British Telecom U.K.)
EB-P70023/P		Vodac U.K.	EB-Z70186	Packing (Vodac U.K.)

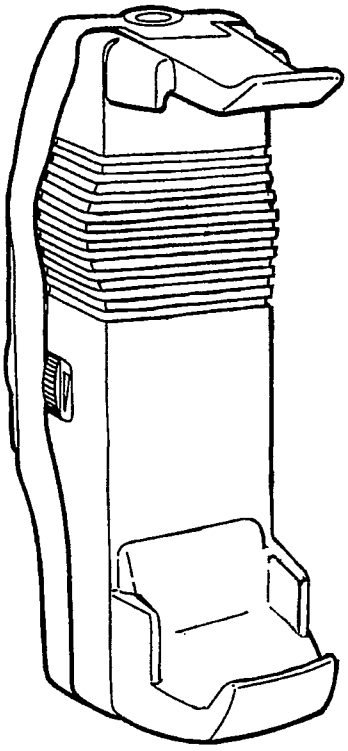
Kit Number	Re-order Number	Kit Name	Kit Contents	
Trickle Charger				
EB-H70034/P	EB-H70034	Panasonic	EB-H70034	Trickle Charger
EB-H70034/B		British Telecom U.K.	EB-Z70173	Packing (Panasonic)
EB-H70034/P		Vodac U.K.	EB-Z70193	Packing (British Telecom U.K.)
			EB-Z70187	Packing (Vodac U.K.)
Rapid Charger				
EB-H70022/P	EB-H70022	Panasonic	EB-H70022	Rapid Charger
EB-H70022/B		British Telecom U.K.		Packing (Panasonic)
EB-H70022/P		Vodac U.K.		Packing (British Telecom U.K.)
				Packing (Vodac U.K.)
AC Adaptor				
EB-P70024/P	EB-P70024	Panasonic U.K.	EB-P70024	AC Adaptor (U.K.)
EB-P70024/P	EB-P70024	British Telecom U.K.	EB-P70035	AC Adaptor (Europe)
EB-P70024/P	EB-P70024	Vodac U.K.	T1-MDS-219	Packing (Panasonic U.K.)
EB-P70035/P	EB-P70035	Panasonic Europe	T1-MDS-184	Packing (British Telecom U.K.)
			T1-MDS-234	Packing (Vodac U.K.)
				Packing (Panasonic Europe)

1.2 Appearance of Telephone

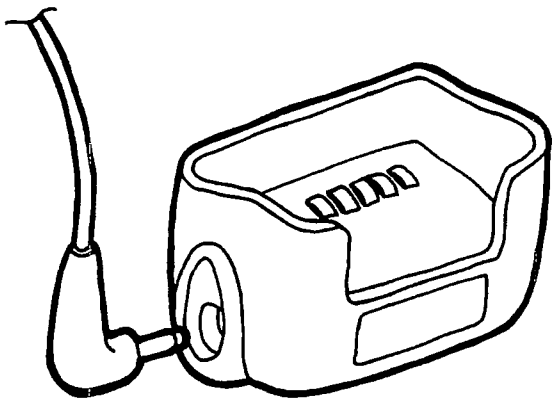


1.3 Apperance of Accessories

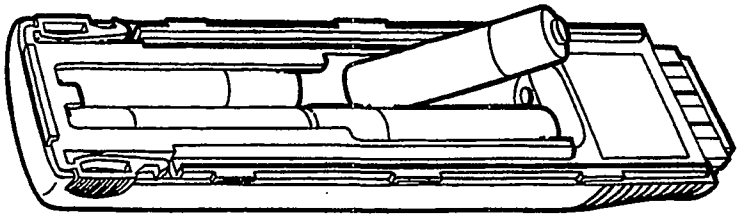
Telephone holder for carmount kit



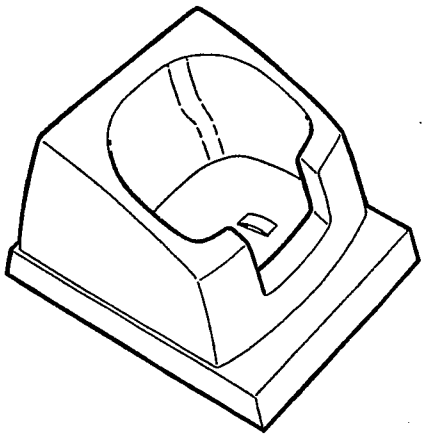
Headset adaptor



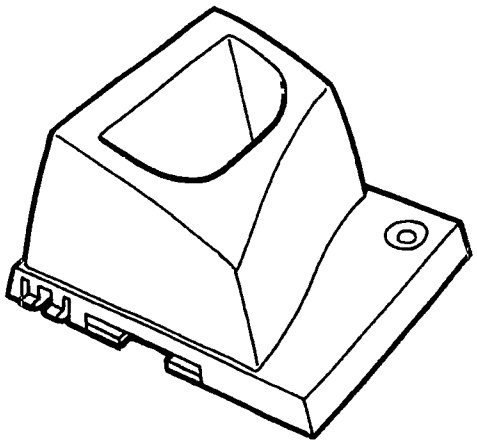
Dry battery case



Rapid charger



Trickle charger



2 TECHNICAL DESCRIPTIONS

2.1 Specifications

2.1.1 Ratings

No.	Item	Specifications
1	Frequency range	872.0125MHz to 904.9875MHz
2	Transmit/Receive frequency separation	45MHz
3	RF channel spacing	25kHz
5	Antenna terminal impedance	50Ω
6	RF output power	0.6W
7	Power source	+4.8V DC (negative ground)
8	Operating temperature	-10°C to +55°C
9	Power consumption: Transmit Standby	 +4.8V Approx. 500mA at 0.6W +4.8V Approx. 45mA
10	Dimensions (W x H x D)	145mm x 48mm x 26mm - with 600mAh battery fitted 145mm x 48mm x 32mm - with 900mAh battery fitted
11	Weight	270g - with both batteries
12	Volume	175cc - with 600mAh battery fitted 195cc - with 900mAh battery fitted

2.1.2 Transmitter

No.	Item	Specifications		
1	Frequency range	872.0125MHz to 904.9875MHz		
2	Frequency stability	< ±2.5PPM		
3	Channel switching time:	Adjacent channel Non-adjacent channel	< 10ms < 40ms	
4	Carrier inhibiting time	< 2ms		
5	RF output power	0.6W		
6	RF output power control	Power Level 2 3 4 5 6 7	Attenuation 2dB 6dB 10dB 14dB 18dB 22dB	Power 27.8dBm 23.8dBm 19.8dBm 15.8dBm 11.8dBm 7.8dBm
7	RF output power tolerance	< +2dB, > -4dB		
8	RF power transition time	< 20ms		
9	Carrier on-off time	< 2ms		
10	Modulation deviation limit	±9.5kHz		
11	Modulation noise and distortion	< -26dB		
12	Harmonic and spurious emission conducted	< -41dB		
13	Transmit-audio filtering:	400 to 2,250Hz 300Hz 2,500Hz 3,000Hz 200Hz 3,500Hz	< +1dB, > -1dB < +1dB, > -3dB < +1dB, > -2dB < +1dB, > -6.5dB < 24dB/oct +1dB > -30dB /oct	
14	SAT frequency deviation	1.7kHz ±10%		
15	Audio voice muting level	> 40dB		

2.1.3 Receiver

No.	Item	Characteristics	
1	Frequency range	917.0125MHz to 949.9875MHz	
2	Distortion	< -26dB	
3	Hum and noise	< -32dB	
4	RSSI Vo voltage	0.5 ≤ Vo ≥ 2.0V	
5	Selectivity	< 55dB +25kHz, > -25kHz	
6	Spurious response	> -55dB	
7	RF sensitivity	> -110dBm	
8	Receive-audio filtering	400 to 2,250Hz 360Hz 300Hz 240Hz 3,000Hz 200Hz > 3,800Hz <	< +1dB, > -1dB < +1dB, > -2dB < +1dB, > -6.5dB < +1dB < +1dB , > -3dB > +24dB / oct-1dB < -36dB / oct+1dB
9	Inter-modulation response	> 55dB	

2.2 General Block Diagram

The Panasonic personal cellular telephone consists of the units shown below.

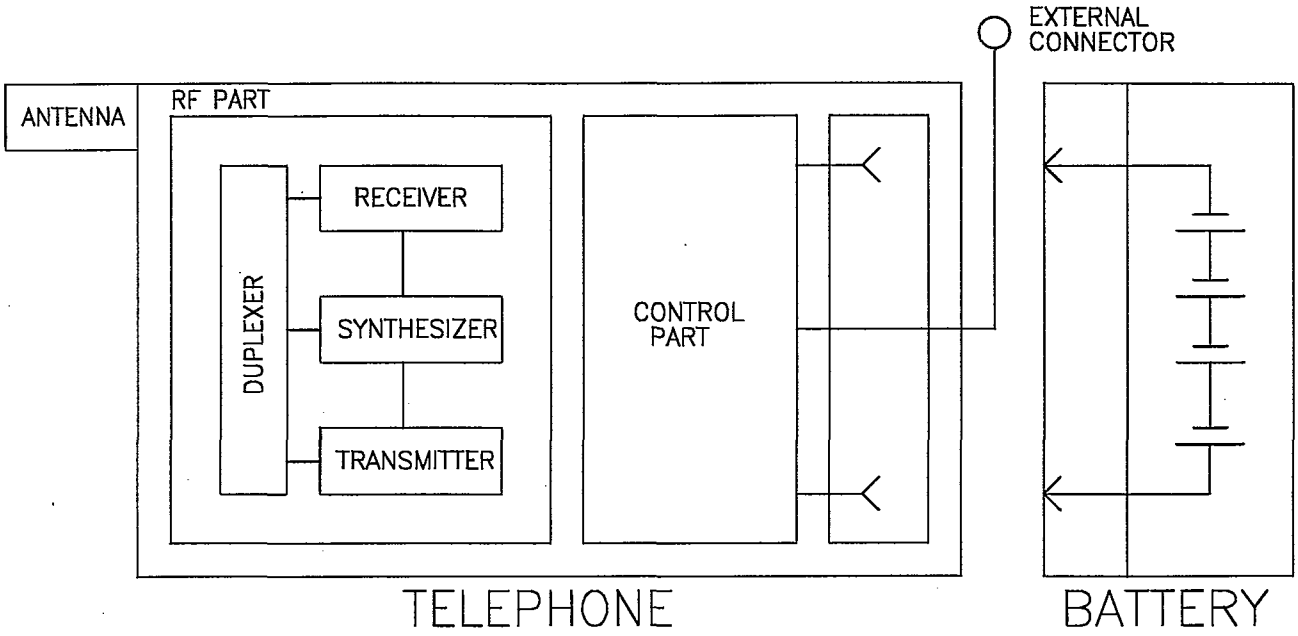


Figure 2.2-1: Personal cellular telephone block diagram

3 OPERATING INSTRUCTIONS

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1 BEFORE USING YOUR TELEPHONE

General precautions

- This apparatus is approved for connection to any TACS cellular radio network run by Vodafone Limited and Cellnet (Telecom Securicor Cellular Radio Limited). The facilities offered by the apparatus are identical on any network in so far as a network is able to support any particular facility.
- This apparatus is intended for use when supplied with power from:
  Rapid charger EB-P70022 with AC Adapter EB-P70024 or Trickle charger EB-H70034.
  Other usage will invalidate any approval and warranty given to this apparatus and may be dangerous.
- Pressing any of the keys produces a loud tone. Avoid holding the telephone close to your ear when pressing the keys.
- Avoid contact between your face (especially eyes) and the antenna while the telephone is in use.
- Switch off your cellular telephone when in an aircraft. The use of cellular telephones in aircraft may be dangerous to the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.
- Users are advised to turn off the equipment when at a refuelling point, or where there are signs posted restricting the use of two-way communications equipment, such as at construction and blast sites.
- Speed dial memory may be corrupted or lost if the battery or external power source is disconnected for a long period of time (approximately 30 days) or when your telephone is new.
- Always use Panasonic approved accessories (cables etc.) in order to maintain full performance of your telephone and avoid damage.

Use of cellular telephones in a vehicle

- Acquaint yourself thoroughly with applicable highway code guidelines regarding the use of mobile radios and radio telephones in the areas where you drive and observe them at all times.
- Do not install or connect your telephone if the vehicle uses a positive (+) grounding system.
- Always disconnect the telephone before attempting to jump start your vehicle.

Battery and battery charger precautions

- Charge the battery before operation.
- Intermittent use between short charges will seriously reduce battery life. Users are recommended to use a battery until the low battery warning tone sounds before replacement. It is more efficient to recharge fully discharged batteries. If the battery charge capacity has deteriorated through such imprudent use; completely discharge the battery by using the telephone until the power shuts off automatically then charge it several times. If the battery fails to recover to its original capacity, a new battery should be obtained.
- The use of any battery charging equipment other than that specified may damage your telephone or result in inferior performance.
- Do not attempt to disassemble the charging apparatus. There are no user serviceable parts inside.
- Always disconnect the AC adapter from the mains when not in use.
- If the charger becomes damaged in any way, do not use it. Take it to a qualified service centre for repair.
- The charger and batteries may become warm during charging. This is normal.
- Always charge the batteries in a well ventilated area. It is not possible to recharge the batteries at temperatures below +5°C or above +40°C.
- Batteries that are not used for a long time should be fully recharged at least once every two months.
- Old batteries should be disposed of in accordance with local legislation. They must not be incinerated, or disposed of as ordinary rubbish.
- Do not store, or carry, batteries with any metallic items that may accidentally connect across the positive and negative terminals.

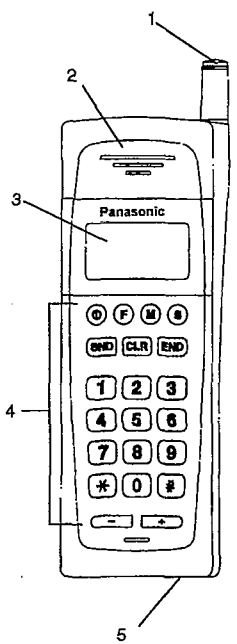
1.1 Optimal Service Information

DON'T use this equipment in environments of extremely high temperatures or humidity.	Use the equipment within the temperature range of -10°C to +55°C. Battery recharging must be performed within the temperature range of +5°C to +40°C.
DON'T attempt to disassemble this equipment. There are no user-serviceable parts inside.	Refer servicing to qualified service and repair personnel, or refer to your local dealer.
DON'T strike, shake or subject the equipment to excessive vibration.	Handle the equipment with care.
DON'T expose the equipment to rain and avoid contact with any liquids.	Take immediate action if the equipment becomes wet. Turn the power off, remove the battery and contact a service centre as soon as possible.

- The display on your telephone may at times change slightly in colour, or take somewhat longer than usual to display characters in extreme temperatures, this is normal and does not indicate a defect in the display.
- When making or receiving telephone calls, either fully extend or retract the antenna for best reception.
- To prevent your telephone from being used when you are absent, it is recommended that you memorise your lock code so as to avoid having to write it down, where it might be accessible to others.

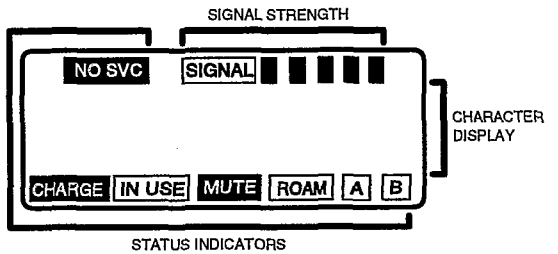
- If, when you turn the power on, an "OFF/ON" message is displayed, switch the power off and then turn it on again. Contact your dealer if the "OFF/ON" message does not disappear.
- If the display shows "NO SVC", you have moved outside the service coverage area. Move towards a radio coverage area until the "NO SVC" message disappears. The telephone may then be used.
- If your telephone operates with two telephone numbers, check to ensure that the telephone number you are trying to use is the proper one for the network in your current location. If you have two telephone numbers, you will only receive calls for the number currently selected on your telephone.
- The telephone may be cleaned with a soft cloth dampened with a mild detergent and water. Avoid the use of petroleum based cleaners or any other chemical cleaners such as benzine or thinner, which may damage the telephone.

1.2 Location of Controls



1. Antenna
2. Earpiece
3. Display
4. ⓞ Switches power ON or OFF.
   Ⓢ Makes a call with the telephone number in One Touch Dial Memory.
   SND Make a call.
   Ⓜ Stores telephone number and name tag into memory. Recalls memory contents. Function confirmation key.
   END Terminates a call.
   Ⓕ Accesses functions.
   CLR Clears last digit entered or all digits when pressed and held down. Exits functions.
   ⊞ or ⊟ Adjusts the volume. Scrolls letters and displays. Switches function on or off.
   Digit Keys 0 to 9, * and #.
5. Microphone

1.3 Display Indicators



NO SVC Lights up when you are outside a service area.

SIGNAL Lights when you are in a service area; 1 bar for a weak signal and 5 bars for a strong signal.

CHRG Lights up when charge function is activated.

IN USE Lights up when a call is in progress.

MUTE Lights up when the MUTE function is activated.

ROAM Lights up when you are out of your home area, but on the preferred system. Flashes when you are out of your home area but on the non-preferred system.

A Lights up during operation on system A.

B Lights up during operation on system B.

NOTE: Following some operations the display will automatically clear after three seconds.

2 TELEPHONE OPERATION

2.1 Power ON/OFF

To turn the power on:

☛ Ⓓ

A wake-up tone will be heard.
The telephone number for the network which you are currently using will be indicated momentarily.
When a lock function is set, an appropriate message will be displayed. (For details of lock functions refer to "Lock Code", section 4.1).

If a "PIN Corrupted" message is displayed after power ON, pressing any key will clear this message. A new pin number must be entered before the telephone is switched off.

If an "OFF/ON" error message is displayed, turn the power off and then turn it back on. If the message remains contact your dealer.

During handheld use, if no key is pressed for seven seconds, the backlight will turn off. During car-mount use, the backlight will be on constantly.

If "NO SVC" (No Service) indicator remains on, you are beyond range of a service area. Move into a radio coverage area and operate your telephone after "NO SVC" indicator turns off. The telephone is ready for use when the "NO SVC" indicator disappears and the Received Signal Strength indicator appears.

To turn the power off:

☛ Ⓓ (Hold)

2.2 Call Operations

2.2.1 Making a call

1. ☛ the required number (up to 32 digits).
   In case of errors:
   To erase the last digit: ☛ CLR (Once)
   To erase the entire entry: ☛ CLR (Hold)
2. ☛ SND
   To make a call.

"IN USE" indicator lights. When the call is connected, the display is cleared.

If you enter 16 digits or more:

The digits are identified by €.
Example: 1122334455667788990011 22.

To display the first digits:

☛ Ⓕ
☛ Ⓕ (Hold)
While depressing Ⓕ for the second time, the display indicates the upper digits with a ŧ.

2.2.2 Receiving a call

1. When an incoming call is received, a ring tone will be heard and a "Ring" message will flash.
2. ☛ Any keys except Ⓓ.
   When the call is successful, the "IN USE" indicator lights and the display is cleared. You can talk to the other party.

2.2.3 Unanswered calls

The number of call that have been received but not answered will be displayed.

To clear this display:
☛ Any key

2.2.4 Ending a call

☛ END

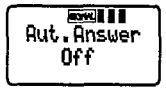
2.2.5 Automatic retry

If a call is unsuccessful and the System Busy Tone sounds, the telephone will redial the telephone number automatically up to three times at one minute intervals. After 3 retries the function is automatically cancelled.
To cancel this function during its operation, press END.

2.2.6 Automatic answer

This feature allows an incoming call to be automatically connected 6 seconds after the ring tone starts, without pressing any keys. Two short tones will sound just before the call is connected.
If any key, except Ⓓ, is pressed within the 6 seconds you can answer the call immediately.
To set this function:

1. ☛ Ⓕ 5



2. ☛ ⊞ or ⊟
   On = To set.
   Off = To cancel.
3. ☛ Ⓜ
   To store the selected setting.

This function setting is retained even after turning the power off.

2.2.7 Calling line identification

When an incoming call is received the caller's telephone number will be displayed, if it is available. If a call is received by the telephone, but not answered, the telephone will automatically store the number. Up to 5 callers details can be stored in this way. The most recently stored number will overwrite to oldest.
Press any key to clear the display.

To recall a caller's telephone number:

1. ☛ Ⓜ #
   To recall the number list.
2. ☛ + or −
   To scroll through the last 5 numbers.
3. ☛ SND
   To call a selected number.

2.2.8 Mute

The mute function turns the telephone microphone off during a call, so that you can hear the caller but the caller cannot hear you.

To set:

☛ Ⓕ +
"MUTE" indicator appears.

To cancel:

☛ Ⓕ +
"MUTE" indicator will disappear.

Mute will automatically be cancelled when the call has ended.

2.2.9 Indicator tones

System Busy Tone:	A rapid dual tone (every ½ second) will be heard when a call cannot be accepted due to a busy channel within the radio coverage area.
Intercept Tone:	A rapid alternating high/low tone will be heard when a call is rejected because the system has detected an error, or is otherwise unable to accept the call.

2.2.10 Sending key tones

If any of the digit keys are pressed, during conversation, the key tones associated with the key will sound and be sent.

2.2.11 Sending key tones from memory

1. *Recall the number sequence to be sent as key tones from* memory.
   (Refer to "Memory", section 3).
2. ☛ Ⓕ
3. ☛ SND
   To send the tones.

   You can activate network facilities such as call waiting and conference calls using this function. For more information, refer to the Subscriber Information Booklet or contact your dealer.

2.2.12 Flash function

This feature can be used for vertical services that may be provided by your network operator.
To activate a flash request, simply press SND, otherwise enter the desired number and press SND.
For more information, refer to the Subscriber Information Booklet or contact your dealer.

2.3 Adjusting the Volume

All volume settings will be retained after power OFF. Except for earpiece volume which will be set to level 3 at power ON.

2.3.1 Keytone volume

This function is not available when the telephone is in use.
Five Keytone volume levels are available.

☛ + or −
To increase or reduce the volume level.

2.3.2 Silent keytone

This function allows you to turn off the Keytone volume.
When silent Keytone is set, you cannot adjust the Keytone volume.
Although key tones will not be sent while this function is set, it is possible to send tones using the "key from memory" function. (Refer to "Sending key tones", section 2.2.10).
To set this function:

1. ☛ Ⓕ 6
2. ☛ + or −
   On = Keytone Volume Off.
   Off = Keytone Volume On.

3. ☛ Ⓜ
   To store the setting.

2.3.3 Earpiece volume

This function is only available when the telephone is in use.
Five earpiece volume levels are available on your telephone.

☛ + or −
To increase or reduce the volume level while in conversation.

2.3.4 Ring volume

The telephone has 5 levels of ring volume.
In car-mount use, you cannot set the ring volume to off.
To adjust the ring volume:

1. ☛ Ⓕ 4

2. ☛ ⊞ or ⊟
   To increase or reduce the volume level.
3. ☛ CLR
   To escape from this mode.

2.4 Call Metering

2.4.1 Call Timer

This telephone has three types of timer:

Last Timer: Indicates the talk time elapsed during the current, or last, call. Updated every ten seconds during a call.

TTL Timer 1: Indicates the total talk time. It cannot be reset.

TTL Timer 2: Indicates the total talk time. This timer can be reset.

The Last Call Timer counts up to 99 minutes, 59 seconds. If the Last Call Timer exceeds the maximum value, the display will continue to show 99 minutes, 59 seconds until the call has ended.
Each Total Timer counts up to 999 hours and 59 minutes. If the total timer exceeds the maximum value the timer will reset to 000 hours and 00 minutes.
Whether both TTL Timer's display the duration of incoming and outgoing calls, or outgoing calls only, is dependent on your dealers programming.

Checking a call timer

1. ☛ Ⓕ 1
2. ☛ ⊞ or ⊟
   To scroll between the 3 timers.

Resetting TTL timer 2

1. ☛ Ⓕ 1
2. ☛ ⊞ or ⊟
   To scroll to TTL Timer 2

3. ☛ 0
   The display will indicate "Reset"
4. ☛ Ⓜ
   To confirm.
   If you press CLR, the display will be cleared without resetting the timer.

2.4.2 Call charge metering

This function gives four types of call charging based on a rate given by your network operator. The function will only operate if special charging signals are provided by the network. The call charge metering function may not be identical to the network billing because of differences in call duration timings.

NOTE: If charge metering is provided, the call charge meter MUST be enabled on your telephone. If it is not, calls may be dropped.

The 4 types of metering are:

Last Unit: Whilst in conversation the charge for the current call is displayed and updated every five seconds. Whilst not in conversation the charge for the last call is displayed.

Home Unit: Indicates the total charge for calls made on your preferred system.

Roam Unit: Indicates the total charge for calls made on your non-preferred system.

All Unit: Indicates the total charge for all calls made on both preferred and non-preferred systems.

Whilst in conversation, Home Unit, Roam Unit and All Unit are not updated.

Each charging meter counts up to 99 999 units. If a counter exceeds this value it will reset to zero.

To read the call charge meters:

1. ☛ Ⓕ 2
2. ☛ ⊞ or ⊟
3. ☛ CLR
   To clear the display.

If the call charging counter is corrupted, the meter will reset to zero and the display will flash. To stop the flashing press Ⓜ and then CLR.

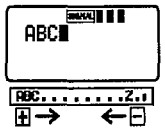
3 MEMORY

Your telephone has capacity to store up to 99 telephone numbers.

3.1 Name Tagging

It is possible to assign a name tag to a telephone number to help remind you of its use at a later date.
A name tag can be up to sixteen characters in length and can include capital letters, full stops, commas and digits.

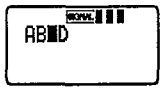
1. ☛Ⓜ
2. ☛Ⓜ
3. ☛⊞ or ⊟
   To scroll through the available characters.
4. ☛#
   To store the letter and move the cursor to the next column.
5. ☛Ⓜ
   To store the name tag.



Correcting Errors

* Moves cursor to the left.
# Moves cursor to the right.

To correct errors:



1. ☛* or #
   To move the cursor onto the error.
2. ☛⊞ or ⊟
   To scroll to the correct character.

To erase characters:

☛CLR (Once)
To erase a single character.

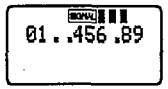
☛CLR (Hold)
To erase the all the characters.

3.2 Speed Dial Memory Storage

There are 99 memory locations available to store telephone numbers, with name tags if they are required.

3.2.1 Storing a telephone number manually

1. ☛Ⓜ
2. ☛Ⓜ
3. ☛ Name Tag (If required)
   (Refer to "Name Tagging", section 3.1) .
4. ☛Ⓜ
5. ☛ Telephone number (up to 32 digits).
6. ☛Ⓜ
7. ☛ The desired memory location (01 to 99).



Example: ☛1. Vacant memory locations in the series from 10 to 19 will be displayed.
("." *indicates that the memory location is occupied*)
☛5. The information will be stored.

If a memory location is occupied, the display will flash.
To store new information, press Ⓜ.
To leave existing information, press CLR and the display will return to "Memory STO". Enter a different memory location.

3.2.2 Storing a telephone number automatically

1. ☛Ⓜ
2. ☛Ⓜ
3. ☛ Name Tag (If required)
   (Refer to "Name Tagging", section 3.1).
4. ☛Ⓜ
5. ☛ Telephone number (up to 32 digits).
6. ☛Ⓜ
7. ☛*

The lowest vacant number location from 01 to 99 will be indicated and the telephone number will be stored automatically at that location.

Automatically storing numbers in specified memory blocks:

This feature could be used to store related numbers in blocks.
Example: 10 to 19 for personal numbers, 20 to 29 for office etc.

When the display "Memory STO" appears:

1. ☛ Memory block (0 to 9)
   Example: Enter 1 for memory block 10 to 19.
   Enter 2 for memory block 20 to 29.
2. ☛ ✱
   The memory content is automatically stored in the lowest vacant memory location within the desired block.

If a desired memory block is occupied.

"Memory Occupied" message is displayed. Wait three seconds and the display will return to "Memory STO". Repeat steps 1 and 2 above to store the number in a different memory block.

3.2.3 Making a call from memory

Method 1:

1. ☛ Ⓜ
2. ☛ Speed Dial memory location (01 to 99)
   Pressing ⊞ or ⊟ allows you to check the next or previous telephone number.
3. ☛ Ⓜ (Hold)
   Releasing the key indicates the telephone number.
4. ☛ SND
   To make a call.

Method 2:

1. ☛ Speed Dial memory location (01 to 99).
2. ☛ SND
   To make a call.

3.2.4 Making a call using name tags

1. ☛ Ⓜ
2. Search for the first letter of the name tag:
   ☛ ⊞ or ⊟ (Hold).
   Each letter of the alphabet is scrolled. When the first letter of the Name Tag that you require is displayed release the key.

   Search for the Name Tag:
   ☛ ⊞ or ⊟ (Once).
   Each Name Tag, starting with the selected letter, will be displayed in alphabetical order.
3. ☛ Ⓜ (Hold)
   To display the phone number.
4. ☛ SND
   To make the call.

3.2.5 Changing memory contents

1. ☛ Ⓜ
2. ☛ Speed Dial memory location (01 to 99)
3. ☛ Ⓕ
4. ☛ Ⓜ
5. ☛ Change the Name Tag
   (Refer to "Correcting Errors", section 3.1).
6. ☛ Ⓜ
7. ☛ Change the telephone number
8. ☛ Ⓜ
   The information will be stored.

3.3 One Touch Dial Memory

One touch dialling is the fastest method of making a call from memory. A frequently dialled telephone number may be stored in to one touch dial memory and a call made automatically by pressing Ⓢ. Ⓢ is not available during conversation.

3.3.1 Storing a telephone number

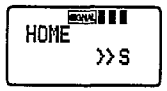
1. ☛ Ⓜ
2. ☛ Ⓜ
3. ☛ Name Tag (If required)
   (Refer to "Name Tagging", section 3.1).
4. ☛ Ⓜ
5. ☛ Telephone number (up to 32 digits)
6. ☛ Ⓜ
7. ☛ Ⓢ. The information is now stored in Ⓢ.

If the memory location is occupied, the display will flash.
To store the new information press Ⓜ.
To lave the existing information; press CLR and the display will return to "Memory STO". Enter a different memory location.

3.3.2 Making a call

☛ Ⓢ

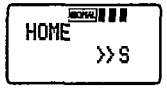
3.3.3 Checking memory contents



1. ☛ Ⓜ
2. ☛ Ⓢ.
   The name tag will be displayed.
3. ☛ Ⓜ (Hold)
   The telephone number will be displayed.

NOTE: If a name tag is not stored, pressing Ⓢ will display the telephone number.

3.3.4 Changing memory contents



1. ☛Ⓜ
2. ☛Ⓢ
   The name tag or telephone number will be displayed.
3. ☛Ⓕ
4. ☛Ⓜ
5. ☛ Name Tag
   (Refer to "Correcting Errors", section 3.1).
6. ☛Ⓜ
7. ☛ Telephone number
8. ☛Ⓜ
   Changed memory content will be stored.

3.4 Scratch Pad Memory

Scratch Pad memory is used to enter a phone number during conversation. The telephone number is automatically stored after ending the call. One memory location has been designated for Scratch Pad.
The scratch pad memory will be automatically overwritten next time it is used.
This memory is retained after turning the power off.

3.4.1 Storing digits

During conversation:

☛ The desired digits (Up to 32 digits).

The digits will be stored automatically and the display will be cleared at the end of the call.

3.4.2 Making a call from scratch pad memory

1. ☛Ⓜ ✱
   The telephone number that has been stored in Scratch Pad memory will appear.
2. ☛ SND
   To make a call.

The scratch pad information can be saved to One Touch Dial memory and Speed Dial memory by pressing Ⓕ Ⓜ, after recalling the memory contents. (Refer to "One Touch Dial Memory", section 3.2, and "Speed Dial Memory Storage", section 3.3).

3.5 Last Number Memory

Last Number memory automatically stores the last five telephone numbers that have been dialled.

Making a call from the last number memory:

1. ☛Ⓜ 0 0
   The last telephone number dialled will be displayed.
2. ☛ ⊞ or ⊟
   To scroll through the last five dialled numbers.
3. ☛ SND
   To make a call when the required number has been selected.

If you used the Pause Dial on your last call, only the digits up to the pause will be dialled.

The Last Number memory contents can be saved in to One Touch Dial memory and Speed Dial memory by pressing Ⓕ Ⓜ, after recalling the memory contents. Refer to "Speed Dial Memory Storage", section 3.2, and "One Touch Dial Memory", section 3.3.

3.6 Pause Dial

The Pause Dial function uses the key tones generated by your telephone to access functions outside the cellular network, such as voice mail retrieval.
The pause dial sequence may contain up to 32 digits, including the pause character, "P", it may be stored in one touch and speed dial memory. Refer to "Speed Dial Memory Storage", section 3.2, and "One Touch Dial Memory", section 3.3.

3.6.1 Pause dial programming

1. ☛ Telephone number
2. ☛Ⓕ #
   The "P" will be displayed.
3. ☛ The additional digits.
4. Repeat 2 and 3 until the pause dial has been entered.
5. ☛ END
   To exit Pause Dial programming mode.

3.6.2 Sending pause dial numbers

1. ☛ The pause dial number (or recall from memory).
2. ☛ SND
   The digits up to the first "P" will be sent.

When the call is connected:

3. ☛ SND
   The numbers up to the next "P" will be sent.
4. ☛ SND
   Until all the digits have been sent.

The last digits sent will be indicated on the display even after the above sequence has been completed.

NOTE: Only the number from the first digit to the first "P" will be stored in Last Number Memory.

4 SECURITY

4.1 Lock Code

Two levels of password controlled locks are available, to enable you to limit the way in which your telephone is used.

Full lock: Incoming calls may be answered, but no outgoing calls may be made.

Partial lock: Incoming calls may be answered. Outgoing calls can only be made from the telephone memory.

NOTE: Your normal emergency numbers can be dialled directly at any lock setting, without having to enter a lock code.

4.1.1 Setting locks

1. ☛ Ⓕ 3
2. ☛ The lock code
   If you enter the wrong lock code start again.
3. ☛ ⊞ or ⊟
   To scroll through the lock menu.

4. ☛ Ⓜ
   To select the lock setting.

4.1.2 Changing the lock code

Factory setting for the lock code is 0000.

The lock code may be changed to any 2, 3 or 4 digit number combination, including the * and # characters.
The lock code is retained after power off.

1. ☛ Ⓕ 0

2. ☛ The current lock code
3. ☛ The new lock code
   If you make an error, press CLR.
4. ☛ Ⓜ
   The new lock code will be stored.

If you forget your lock code, contact your dealer.

4.2 Identification PIN

IMPORTANT: DO NOT alter the Identification PIN unless advised by your network operator, as this may prevent you from making or receiving telephone calls. This facility MAY NOT be available from all network operators.

The telephone has the facility for an identification PIN. This provides improved protection against fraudulent use of a mobile telephone. If fraudulent use is detected by the network operator, the authorised user will be issued with a new PIN.
The telephone is already programmed with an identification PIN when it is purchased. DO NOT alter this PIN unless advised by your network operator.

For security reasons it is not possible to check the PIN.

To program a new identification PIN:

1. ☛ⓘ
   To turn the power on.
2. ☛ 2 5 3 9 Ⓕ Ⓕ
   To enter identification number programming mode.
3. ☛ Lock code

If you have two telephone numbers programmed your first telephone number will then be displayed.

4. ☛ ⊞ or ⊟ to display the desired telephone number.
   ☛ Ⓜ to select.

Each telephone network that you subscribe to may supply a 16 figure identification PIN. You must select the correct telephone number for that network supplier's identification PIN.

5. ☛ 16 digit PIN
   The number will be shown on the display. If an incorrect digit is entered press CLR and re-enter the correct digit.
6. ☛ Ⓜ
   To enter the PIN.

NOTE: EXIT can be used at any time to exit from PIN Programming mode.

If you should make a mistake entering your Identification PIN repeat steps 2 through to 6.

4.3 Automatic Lock

If the automatic lock function is programmed by your dealer the telephone will be set to Auto Lock at power on, even if the previous lock was set to "Unlock". Auto Lock operates in the same way as full lock.

☛ⓘ

☛ Lock code
When the lock code is entered, the display will be cleared. However Automatic Lock will be active again the next time power is switched on.

To cancel the automatic lock function, contact your dealer.

4.4 Dialling Digit Restriction

The Dialling Digit Restriction feature allows you to limit the number of digits that may be dialled from your telephone and could be used, for example, to prevent the dialling of long distance calls. The restriction can be set to any number between 1 and 31.

1. ☛ Ⓕ 9
2. ☛ Lock code

The current digit restriction will flash.

3. ☛ The new digit limit.
   The display will stop flashing.
   To set: 01 to 31
   To cancel: 00
   If you make an error, press CLR.
4. ☛ Ⓜ
   To confirm.

5 SYSTEM OPERATIONS

The following functions are only available if you are registered to both a preferred and non-preferred network.

5.1 System Select

The cellular mobile telephone system to which you have registered is known as the preferred network. It may be possible to use your telephone on another network; the non-preferred network. This facility is known as roaming and may be programmed into your telephone by your dealer. Two networks are available, system A (Vodafone) and system B (CELLNET). Either of these can be your preferred network.

Normal Mode (System A or B mode):
If the telephone is located in a System A or System B area, it will automatically select the correct network, provided your telephone is programmed for use on both networks. If both networks are available, your preferred system is given priority.

System A Mode:
The telephone selects system A only.

System B Mode:
The telephone selects system B only.

Selecting the system

1. ☛ Ⓕ 7
2. ☛ ⊞ or ⊟
   To scroll through the system select menu.

3. ☛ Ⓜ
   The setting will be stored.

If programmed by the dealer, the system setting may be retained after power off. Otherwise, the system setting will always go to your preferred system at power on.

5.2 Changing Your Current Telephone Number

This function cannot be changed during conversation.
Using this function it is possible to select the telephone number that you wish to operate on.

1. ☛ Ⓕ 8
2. ☛ ⊞ or ⊟
   To display your second telephone number.

3. To use the second telephone number:
   ☛ Ⓜ
   or to clear the display:
   ☛ CLR

6 BATTERY INFORMATION

6.1 Battery Specifications

	900mAh Ni-Cd (Standard)	600mAh Ni-Cd (Optional)	Dry Alkaline Batteries
Stand-by Time	≈ 15 hours	≈ 10 hours	≈ 24 hours
Talk Time	≈ 90 minutes	≈ 50 minutes	≈ 50 minutes

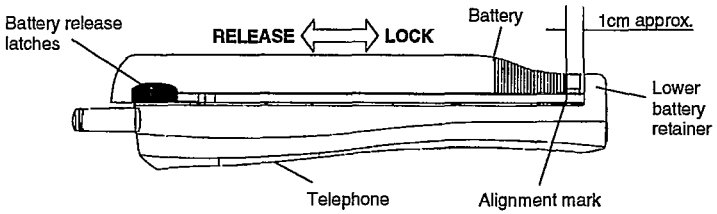
These figures are based on fully charged batteries or new Alkaline Dry batteries.

6.2 Fitting a New Battery

Turn the telephone face downwards.

Fitting the battery

Place the battery on the back of the telephone, positioned approximately 1cm from lower battery retainers. Slide the battery to lock into position.

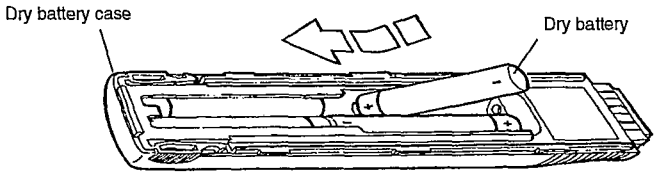


Removing the battery

Press the two battery release latches. Slide the battery towards the antenna to release. Lift the battery from the telephone.

6.3 Using a Dry Battery Pack

Using the dry battery pack it is possible to power your telephone from 4 AA size alkaline batteries.



Insert the first dry battery into the wide part of the battery compartment, following the polarity (+ and -) indications. Slide the battery toward the narrow part of the battery compartment. Place the next battery into the same side of the battery compartment, ensuring that the polarity is the same as the first, and push home. Repeat for *the batteries in the other side of the battery compartment.*
Do not attempt to recharge the dry batteries.

6.4 Battery Level Indicator

During Handheld use, you can check the remaining battery life. Battery power level is indicated on a 4 bar meter.

To check the battery power level:

☛ Ⓕ ✱

If the battery level falls below 1 bar, a "Low Battery" message will flash and a Low Battery Tone will sound.

6.5 Low Battery During Use

If during conversation a low battery warning tone is given, it is possible *to exchange the battery with a fully charged one, without dropping the* call.
This operation must be carried out within approximately four seconds.

6.6 Battery Charging

Dry batteries must not be recharged.

	900mAh Ni-Cd (Standard)	600mAh Ni-Cd (Optional)
Rapid Charger	≈ 2.5 hours	≈ 1.5 hours
Trickle Charger	≈ 10 hours	≈ 6 hours
Handsfree Charger	≈ 2.5 hours	≈ 1.5 hours

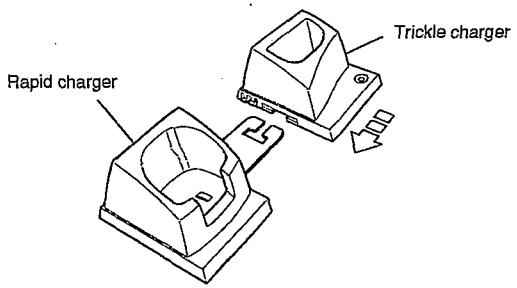
Charging time will be longer if the telephone is switched on, or if the *temperature is lower than normal room temperature.*
Batteries that have never been charged or have not been charged for several months will take longer to charge.

Rapid charger (standard)

1. Connect the AC adapter plug to the desk top charger.
2. Connect the AC adapter to the mains supply.
3. Set the telephone, with battery, into the slot.
4. Charging will begin immediately and the charge indicator on the display will light.
5. When the indicator turns off, indicating full recharge, remove the battery from the charger.

Trickle charger (optional)

This is an extension to the charger supplied with the telephone and provides an additional charger slot for another battery.



Handsfree cradle charger (optional)

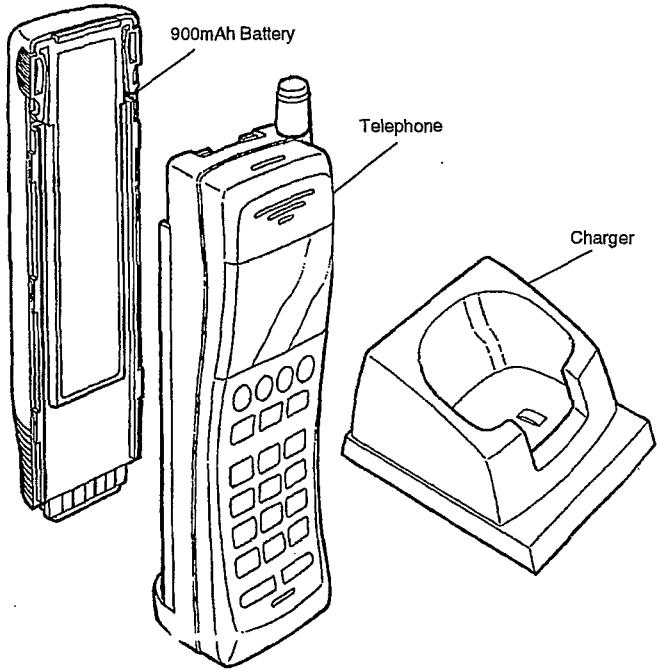
The optional Handsfree Car Mounting Kit contains an integral battery charger, that will recharge the telephone battery during car mount operation. It is not possible to place the telephone in the Handsfree cradle with the dry battery pack fitted.

7 KIT COMPOSITION

Optional accessories may be changed without notice.

7.1 Main Kit Composition

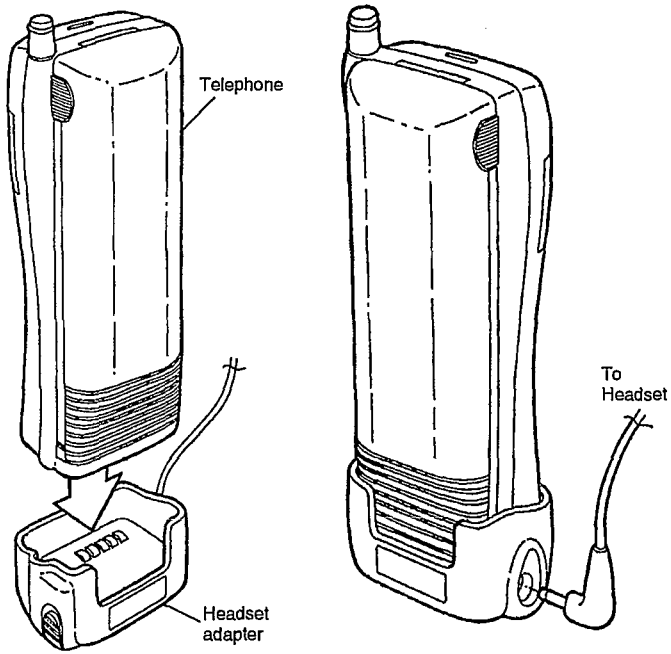
Description	Part Number
Telephone	EB-3650
Battery (900mAh)	EB-P70020
Rapid charger	EB-P70022
AC Adapter	EB-P70024
Quick Reference Guide	EB-Z70099
Operating Instructions	—



7.2 Optional Accessories

Description	Part Number
Headset kit	EB-KJ0290
Car mount kit	EB-KJ0287
Trickle charger	EB-KJ0313
Carry case	EB-KJ0309
Battery (900mAh)	EB-KJ0310
Battery (600mAh)	EB-KJ0311
Dry battery pack	EB-KJ0312

7.2.1 Headset adapter

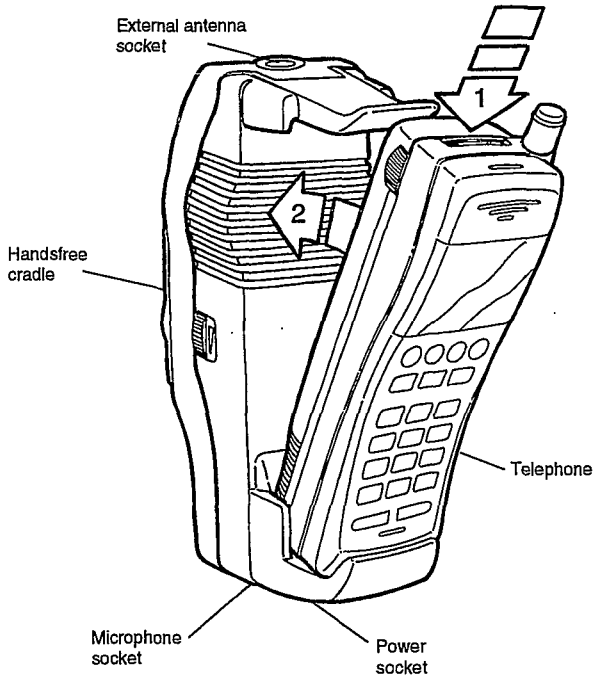


7.3 Installation of Car Mount Kit

1. *Select a cradle installation position that will not obstruct driving.* It is possible to attach the cradle to the adjustable angle bracket using 4mm screws.
2. Connect the power supply cable.

Cable	Fuse	Connection
Black	10A	Battery (-)
Red	5A	Battery (+)
Blue	3A	Ignition

3. Connect the microphone, ensuring that the microphone is 50cm from the handsfree speaker, and the antenna.
4. Switch the telephone power off and insert the telephone into the handsfree cradle. It is not possible to place the telephone in the Handsfree cradle with the dry battery pack fitted.



The Serial Number may be found on the outside of the telephone. For your convenience, we recommended that you note the following numbers in this book as a record of your purchase.	
Model Number:	
Serial Number:	
Name of dealer:	
Date of purchase:	

4 NAM PROGRAMMING AND SERIAL NUMBER

4.1 Number Assignment Mode (NAM)

Information for two telephone numbers may be stored in this equipment. One is called NAM1 and the other is called NAM2. NAM1 must be always written at first and then NAM2 will be written if a user wants to have a second telephone number.
If NAM1 is not written correctly the equipment enters the NAM virgin mode. The equipment cannot operate with a virgin NAM.
If NAM1 is not written correctly NAM2 cannot be written. Certain items of information in the NAM are common to NAM1 and NAM2. If both NAMs are written correctly the function of 2 selectable telephone numbers is enabled. If NAM2 is left unprogrammed the equipment will use the information in NAM1 and therefore only one telephone number will be available.

4.1.2 Information in NAM

The NAM stores the following information in the format given in table 4.1.2-1. The (C) following some items indicates that the item is common to NAM1 and NAM2; the (I) indicates that the item is independent in each NAM respectively.

Home Area ID (AIDH) (I)
The AIDH is a 15-bit number that is used by the equipment to make the "HOME/ROAM" decision.

Mobile ID Number (MIN1 and MIN2) (I)
MIN1 and MIN2 together form the Mobile Identification Number (MIN) a 34-bit number that identifies that the equipment.

Preferred System Mark (PREF PS) (I)
This 1-bit when set to "1" identifies that the preferred system of the equipment is System A; otherwise the preferred system is System B. Vodafone is System A and Cellnet is System B.

First Paging Channel (FPCH) (I)
The FPCH is an 11-bit number of the first control channel in the selected network.

Access Overload Class (ACCOLC) (I)
The ACCOLC is a 4-bit number used to identify the overload class of the equipment.

Group ID Mark (GIM) (I)
The GIM is a 4-bit number served from the Home Area ID. It is used by the system to identify traffic areas.

Lock Code (LOCK DIGITS) (C)
This 4x4-bit number represents the sequence of four decimal digits that are used in unlocking the equipment.

Automatic Lock (ATL) (C)
This 1-bit mark when set to "1" indicates that the equipment is optioned for Automatic Lock enabled.

Local Use (LU) (C)
This 1-bit mark when set to "1" indicates that home equipment is optioned for local control.

EX Mark (EX) (C)
This 1-bit mark when set to "1" indicates that the equipment must send both MIN1 and MIN2 when accessing the system.

Call Charge Units Mark (CCU) (C)
This 1-bit mark when set "1" indicates that the equipment is optioned for computation of call charges.

ABBS Latch (ABL) (C)
This 1-bit mark when set to "1" indicates that the function set of A/B System Select which is selected by the user is latched after power off.

Build-in Monitor (BIM) (C)
This 1-bit when set to "1" enables status information to be displayed on the LCD.

Panasonic Battery Saving Mode (PSBM) (C)
This 1-bit mark when set to "1" indicates that the equipment is optioned for battery saving function.

DTMF Tone Interval (DTI) (C)
This 1-bit mark when set to "1" indicates that the equipment is optioned to send DTMF tone as long as a key is pressed.

Total Timer Addition (TTA) (C)
This 1-bit mark when set to "1" indicates that the total elapsed time is for both originating and receiving calls.

Letter Mode (LETTER MODE) (C)
This 4-bit number when set to "2", "3" or "4" indicates to allow the particular alphabet of Spanish, Italian and German to be displayed on the LCD.

Emergency Call Number (EMRG DIGITS) (C)
This enables the operator to use a number other than "999".

Mobile Area Code (AREA DIGITS) (I)
This is used to store non-standard STD codes.

First Detected Control Channel for Preferred System (FDCHP) (I)
The FDCHP is that first dedicated control channel for the preferred system of the equipment when it is optioned for I-ETACS compatibility. When FDCHP is set to all blanks it indicates that the equipment is not optioned for I-ETACS compatibility.

First Dedicated Control Channel for Non-preferred System (FDCHN) (I)
The FDCHN is a 5-bit number that represents the first dedicated control channel for the non-preferred system of the equipment when it is optioned for I-ETACS compatibility. When FDCHN is set to all blanks it indicates that the equipment is not optioned for I-ETACS compatibility.

Address	D7	D6	D5	D4	D3	D2	D1	D0	NAM1	NAM2
00	0	AIDH (14-8)							00	FF
01	AIDH (7-0)								00	FF
02	LU	0	0	0	0	0	0	0	00	FF
03	0	0	MIN2 (33-28)						3E	FF
04	MIN2 (27-24)				0	0	0	0	70	FF
05	0	0	0	0	MIN1 (23-20)				0A	FF
06	MIN1 (19-12)								F9	FF
07	MIN1 (11-4)								FE	FF
08	MIN1 (3-0)				0	0	0	0	00	FF
09	0	0	0	0	0	0	0	0	00	FF
0A	0	0	0	0	0	FPCH (10-8)			00	FF
0B	FPCH (7-0)								00	FF
0C	0	0	0	0	ACCOLC (3-0)				00	FF
0D	0	0	0	0	0	0	0	PS	00	FF
0E	0	0	0	0	GIM (3-0)				00	FF
0F	LOCK DIGIT 1				LOCK DIGIT 2				AA	FF
10	LOCK DIGIT 3				LOCK DIGIT 4				AA	FF
11	0	ABL	0	0	0	0	AUTH	CCU	03	FF
12	0	0	0	0	LETTER MODE				00	FF

Address	D7	D6	D5	D4	D3	D2	D1	D0	NAM1	NAM2
13	BIM	PBSM	DTI	ATL	TTA	HSE	0	0	48	FF
14	AREA DIGIT 1				AREA DIGIT 2				00	FF
15	AREA DIGIT 3				AREA DIGIT 4				00	FF
16	0	0	0	FDCHP (4-0)					00	FF
17	0	0	0	FDCHN (4-0)					00	FF
18	EMERG DIGIT 1				EMERG DIGIT 2				00	FF
19	EMERG DIGIT 3				EMERG DIGIT 4				00	FF
1A	EMERG DIGIT 5				EMERG DIGIT 6				00	FF
1B	EMERG DIGIT 7				EMERG DIGIT 8				00	FF
1C	EMERG DIGIT 9				EMERG DIGIT 10				00	FF
1D	0	0	0	0	0	0	0	0	00	FF
1E	NAM CHECK SUM ADJUSTMENT								ED	FF
1F	NAM CHECK SUM								55	FF

Table 4.1.2-1 - NAM Format

Notes

NAM CHECKSUM = 01010101 (55H).
The lower 1 byte of sum of 32 bytes is 00H.
As for NAM2 the following format is all 00H:

Address 02H.
Address 0FH to 13H.
Address 18H to 1CH.

4.1.3 Write NAM form Keypad

You can write NAM information from the keypad with or without a password adaptor.

1. If you have a password adaptor connected it to the telephone. The equipment is turned on automatically. If you do not have a password adaptor turn the power on and enter password number 1, then password number 2 followed by Ⓕ Ⓜ,within 20 seconds of turning the power on.
2. Once the unit has been turned on and the normal operation mode is displayed:
   Enter ✱ 0 # 0 ✱ 0 # 0 ✱ 1 (password number 1) followed by Ⓕ Ⓜ in order to read and write NAM1; "NAM1 MODE" will be displayed on the LCD.
   Enter ✱ 0 # 0 ✱ 0 # 0 ✱ 2 (password number 2) followed by Ⓕ Ⓜ in order to read and write NAM2; "NAM2 MODE" will be displayed on the LCD.
   NAM2 can only be programmed after NAM1.
3. Enter Ⓜ x x (see note) to read each item from NAM or enter Ⓜ x x to write each item to the NAM.
4. Enter Ⓜ ✱ ✱ to program the NAM information in to the EEPROM.
5. In order to exit NAM mode press END.

Note: x x is an item number and is only valid form 01 to 14. To access NAM1 x x should be from 01 to 14 and to access NAM2 x x should be from 01 to 06 and 12 to 14. Items 07 to 11 can only be accessed by NAM1. See Table 4.1.3-1.

Item Number	Item	Description	Standard Default
01	Home Area ID (AIDH)	5 digits (decimal)	00000
02	Mobile ID Number (OWN NO.)	10 digits (convert into MIN1 and MIN2)	0000000000
03	Preferred System Mark (PRE SYS)	1 digit (System A = 1, System B = 0)	0
04	First Paging Channel (FPCH)	4 digits (decimal)	0000
05	Access Overload Class (ACCOLC)	2 digits	00
06	Group ID Mark	2 digits	00
07	Lock Code (LOCK)	4 digits	0000
08	Function Byte A (FCN1)	A7 Local use A6 EX mark A5 ABSS Latch A4 Not used (0) A3 Call charge units A1 Authentication A1 ... A0 Not used (0)	A7 .... A0 00000000
09	Function Byte B (FCN2)	B7 built-in monitor (Testing only) B6 Panasonic battery saving mode B5 DTMF tone interval (0 = 100ms) B4 Automatic lock B3 Total timer addition B2 .... B0 Not used (0)	B7 .... B0 00000000
10	Letter Mode (LETTER)	2 digit	00
11	Emergency Call Number (EMRG NO)	Up to 10 digits	0000000000
12	Mobile Area Code (OWNAREA)	4 digits	0000
13	First Dedicated Control Channel for Preferred System (FDCHP)	4 digit (decimal)	0000
14	First Dedicated Control Channel for Non-preferred System (FDCHN)	4 digit (decimal)	0000

Table 4.1.3-1 - Item numbers

NAM Programming Example

The NAM data to be written is shown below.

NAM1

Item Number	Item	Value
1	Home Area Identification	2051
2	Telephone Number	2340 - 123456
3	Preferred System	1 (System A)
4	First Paging Channel	23
5	Access Overload Class	5
6	Group Identification Mark	3
7	Lock Code	1234
8	Function Byte 1 Local use EX Mark ABSS latch Reserved Call charge units Authentication Reserved Reserved	 0 0 0 0 1 1 1 1
9	Function Byte 2 built in monitor Panasonic battery saving mode DTMF tone interval Automatic lock Total timer addition Reserved Reserved Reserved	 0 1 1 0 0 0 0 0
10	Letter Mode	00
11	Emergency Call Number	999
12	Mobile Area Code	NULL
13	First Dedicated Control Channel For Preferred System	NULL
14	First Dedicated Control Channel For Non-preferred System	NULL

Item Number	Keypad Entry	Display Results	Comments
	[*][0][#][0][*][0][#][0][*][1][F][M]	SIGNAL NAM1 MODE	Select NAM1 write mode
	[M][0][1]	SIGNAL 00000 AIDH >>01	Current setting
1	[2][0][5][1][M]	SIGNAL 2051 AIDH >>01 IN USE	Set area identification

Item Number	Keypad Entry	Display Results	Comments
2	+2340123456	SIGNAL 2340123456 OWN NO.>>02 IN USE	Set telephone number
3	+1M	SIGNAL 1 PRE SYS >>03 IN USE	Preferred system
4	+23M	SIGNAL 23 FPCH >>04 IN USE	First paging channel
5	+5M	SIGNAL 5 ACCOLC >>05 IN USE	Overload class
6	+3M	SIGNAL 3 GIM >>06 IN USE	Group identification
7	+1234M	SIGNAL 0000 LOCK >>07 IN USE	Lock code
8	+11111000M	SIGNAL 11110000 FCN >>08 IN USE	Function byte 1
9	+01100000M	SIGNAL 01100000 FCN >>09 IN USE	Function byte 2
10	+0M	SIGNAL 0 LETTER >>10 IN USE	Letter mode
11	+999M	SIGNAL 999 EMRG NO >>11 IN USE	Emergency call number
12	M12.... set to NULL (+xxxxM if set to 4 digits Area Code)	SIGNAL OWNAREA>>12 IN USE	Mobile area code
13	M13.... set to NULL (+xxxxM if set to 4 digit FDCHP)	SIGNAL FDCHP >>13 IN USE	First dedicated control channel for preferred system
14	M14.... set to NULL (+xxxxM if set to 4 digit FDCHN)	SIGNAL FDCHN >>14 IN USE	First dedicated control channel for non-preferred system
	M**	SIGNAL WNAM1 OK IN USE	Write NAM1 to memory
	END		Return to normal mode

NAM2

Item Number	Item	Value
1	Home Area Identification	3600
2	Telephone Number	2342 - 123456
3	Preferred System	0 (System B)
4	First Paging Channel	323
5	Access Overload Class	6
6	Group Identification Mark	0
12	Mobile Area Code	NULL
13	First Dedicated Control Channel For Preferred System	NULL
14	First Dedicated Control Channel For Non-preferred System	NULL

Item Number	Keypad Entry	Display Results	Comments
	*0#0*0#0*2FM	SIGNAL NAM2 MODE	Select NAM2 writing mode
	M01	SIGNAL 00000 AIDH >>01	Current setting
1	3600M	SIGNAL 3600 AIDH >>01 IN USE	Set area identification
2	+2342123456	SIGNAL 2340123456 OWN NO.>>02 IN USE	Telephone number
3	+0M	SIGNAL 0 PRE SYS >>03 IN USE	Preferred system
4	+323M	SIGNAL 323 FPCH >>04 IN USE	First paging channel
5	+6M	SIGNAL 6 ACCOLC >>05 IN USE	Overload class
6	+0M	SIGNAL 0 GIM >>06 IN USE	Group identification
12	M12	SIGNAL OWNAREA>>12 IN USE	Mobile area code
13	M13	SIGNAL FDCHP >>13 IN USE	First dedicated control channel for preferred system

Item Number	Keypad Entry	Display Results	Comments
14	M 1 4	SIGNAL FDCHN >>14 IN USE	First dedicated control channel for non-preferred system
	M * *	SIGNAL WNAM2 OK IN USE	Write NAM2 to memory
	END		Return to normal mode

Addition information for NAM Programming

Number	Item Name	Abbrev	Valid Numbers		Remarks
			A (Vodafone System)	B (Cellnet System)	
1	Home Area Identification	AIDH	2051 (all of UK)	3600	Home area system number
2	Mobile Identification Number	OWN NUMBER	2340 XXXXXXX 2344 XXXXXXX or 2345 XXXXXXX 6 digits	2342 XXXXXX or 2346 XXXXXX 6 digits	
			NAM format 2340, 2344 or 2345 and 2342 or 2346 are unused to identify the network within the equipment and not the 0836, 0831 or 0374 and 0850 or 0860 STD codes for cellular radio.		
3	First Paging Channel	FPCH	23	323	
4	Access Overload Class Mark	ACCOLC	2nd last digits of telephone numbers, eg: 2340 123456 ACCOLC = 5	Last digit of telephone number ,eg: 2342 123456 ACCOLC = 6	
5	Group Identification Mark	GIM	3	0	

Number	Item Name	Abbrev.	Valid Numbers		Panasonic Standard
			A (Vodafone System)	B (Cellnet System)	
08 FCN1	A7 Local use A6 EX mark A5 ABSS A4 RESERVED A3 Call charge units A2 Authentication A1, A0 RESERVED	LU EX CCU 	0 0 0 0 1 or 0 1 0	0 0 0 0 1 or 0 1 0	0 0 0 0 1 1 0
09 FCN2	B7 Built-in monitor B6 Panasonic battery saving mode B5 Long tone DTMF B4 Automatic lock B3 Total timer addition B2..... B0 RESERVED	BIM PBSM DTI 	0 (1 = Testing only) 1 1 or 0 1 or 0 1 or 0 0	0 (1 = Testing only) 1 1 or 0 1 or 0 1 or 0 0	0 1 1 or 0 1 or 0 1 or 0 0
15	Mobile area code	OWNAREA	If the STD code other than 0374, 0836, 0831,0860 or 0850 is used in future that STD code should be programmed for the own telephone number display feature.		

4.1.4 Write NAM from External Test Set

In order to enter the ID Information Access mode enter the ID INFO command.
Under this condition the following commands can be input to read or write to NAM.
In order to exit the ID Information Access mode the normal command must be input.

Number	Command name	OP Code	Number of additional data bytes	Number of returned data bytes	Function
1	INAM1		0	0	Initialise NAM1. (Set 32 bytes in NAM1 to FFH)
2	INAM2		0	0	Initialise NAM2. (Set 32 bytes in NAM2 to FFH)
3	RNAM1		0	32	Read 32 bytes in NAM1 from the EEPROM and send them to the Test Set.
4	RNAM2		0	32	Read 32 bytes in NAM2 from the EEPROM and send them to the Test Set.
5	WNAM1		44	0	Write 32 bytes of data following the command received from the Test Set into NAM1 area in the EEPROM.
6	WNAM2		32	0	Write 32 bytes of data following the command received from the Test Set into NAM2 area in the EEPROM.

Table 4.1.4-1 - Commands for Writing NAM

4.2 Serial Number

The Serial number is a 32-bit binary number and is unique to the particular mobile equipment.
The serial number information is stored in the EEPROM in the following format:

Equipment Serial Number		Reserved		Equipment Code		Manufactures Code	
31	16	15	12	11	6	5	0

Reading the serial number

The serial number is composed of items of information called "fields". The first field is called the "manufacturer's code", the second is called the "equipment code", the third is reserved and the fourth field is called the "serial number" field. The manufactures code for this model is 15. The equipment code is x x. The serial number is 5 digits. The serial number is assembled as follows:

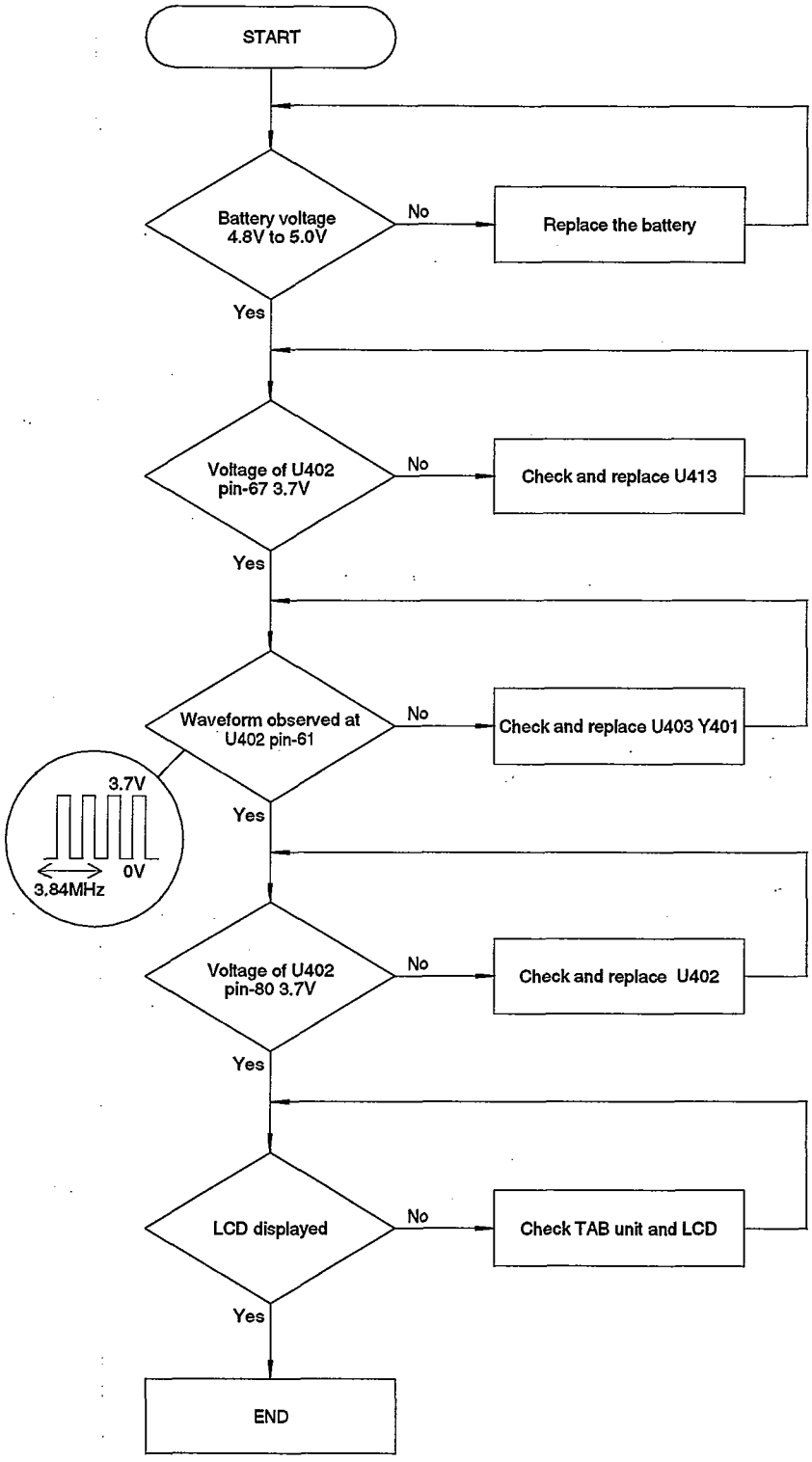
Manufactures code		Equipment code		Reserved		Serial Number Field
15	+	XX	+	00	+	XXXXX

The complete serial number to be reported to the Cellular System provider is then 15xx00xxxx (decimal) which corresponds to the name plate. Refer to SEND SN command described in section 5 of the Service Manual.

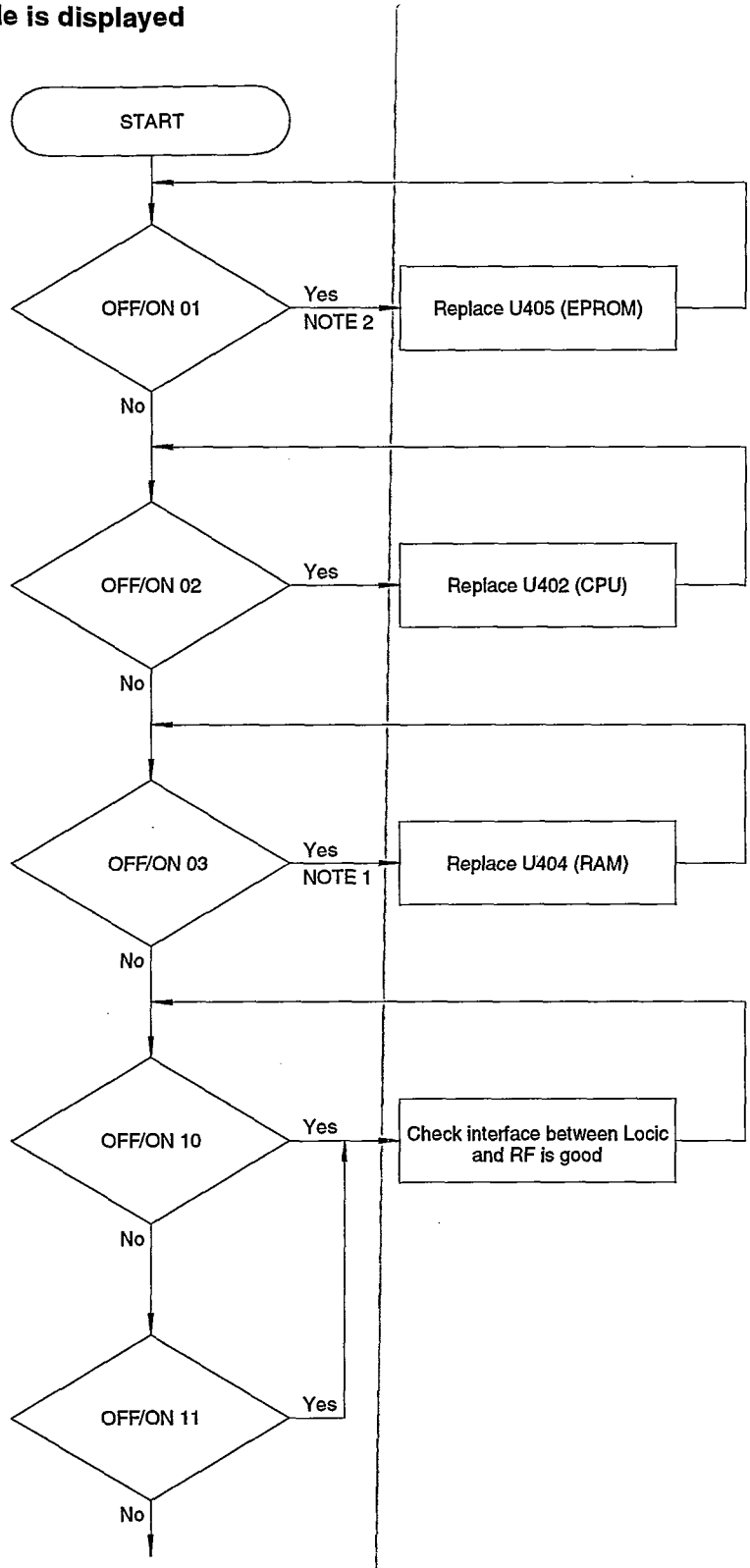
4.3 Trouble shooting

4.3.1 Telephone

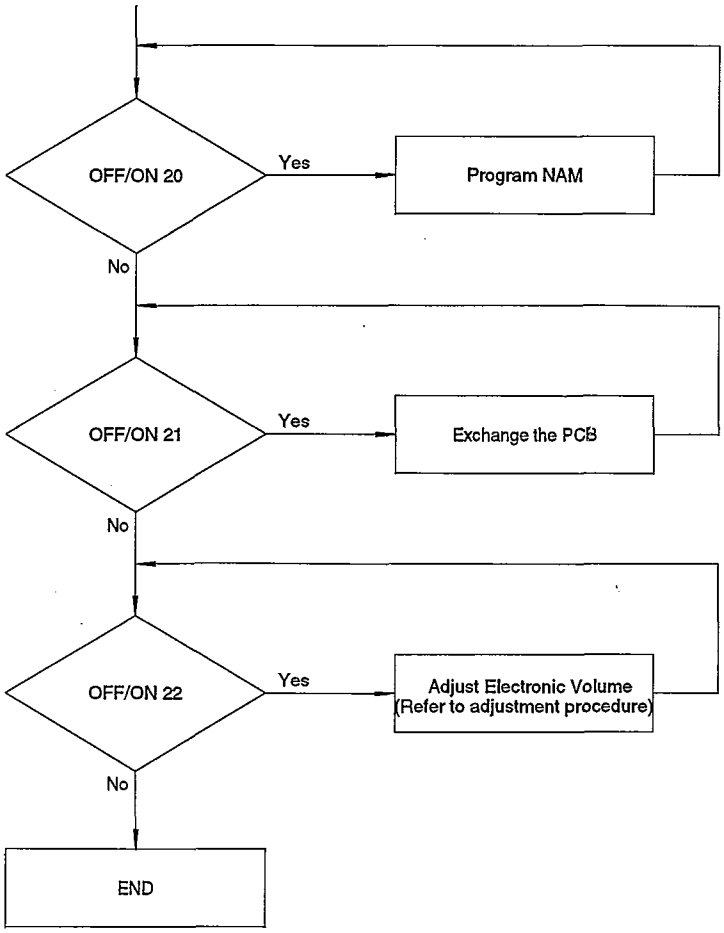
4.3.1.1 Power cannot be turned on



4.3.1.2 Error code is displayed



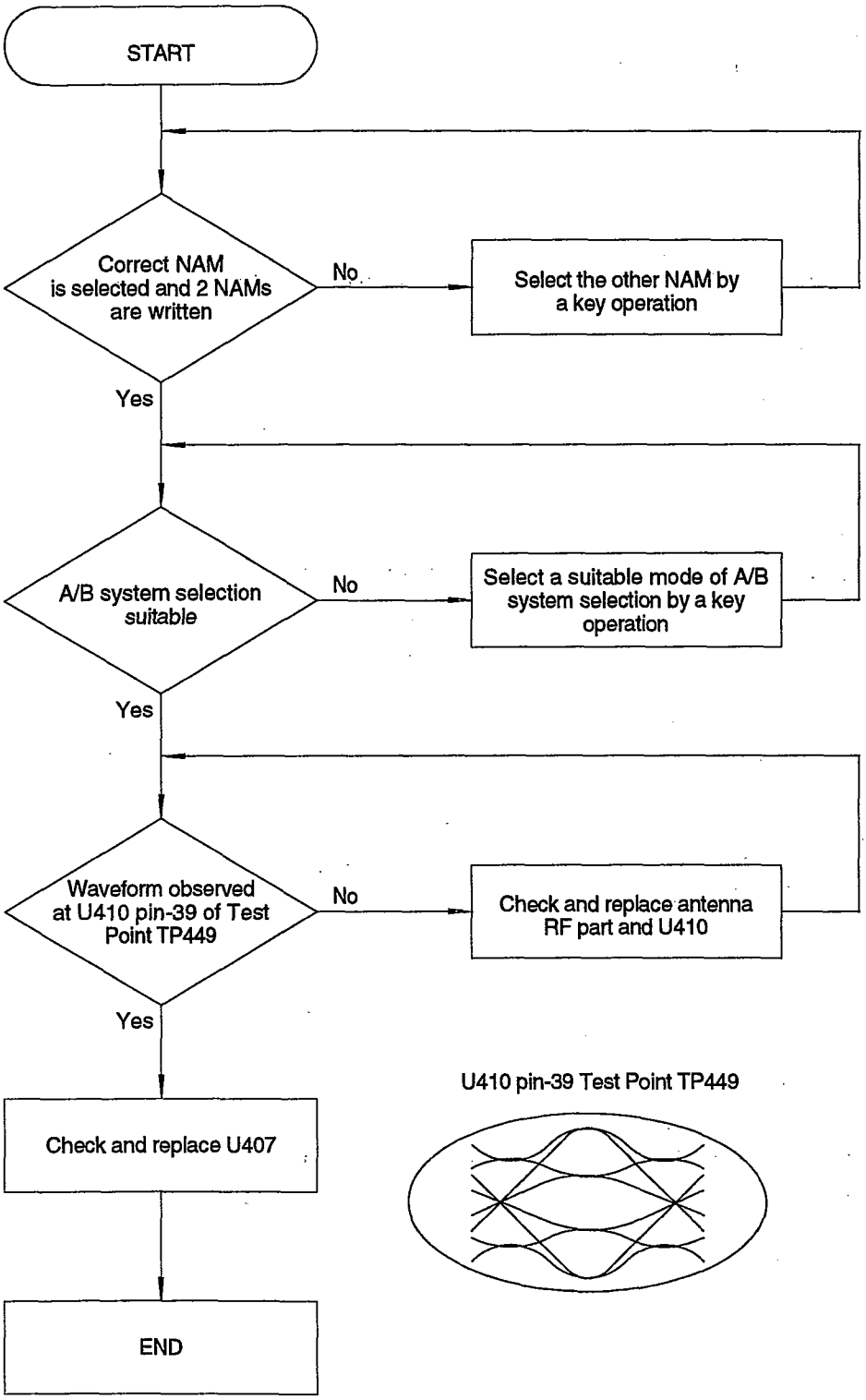
Note:
1. When OFF/ON 10 is displayed check "VDET" line of the interface.
2. When OFF/ON 11 is displayed check "RxLD" and "TxLD" lines of the interface.



Error code table

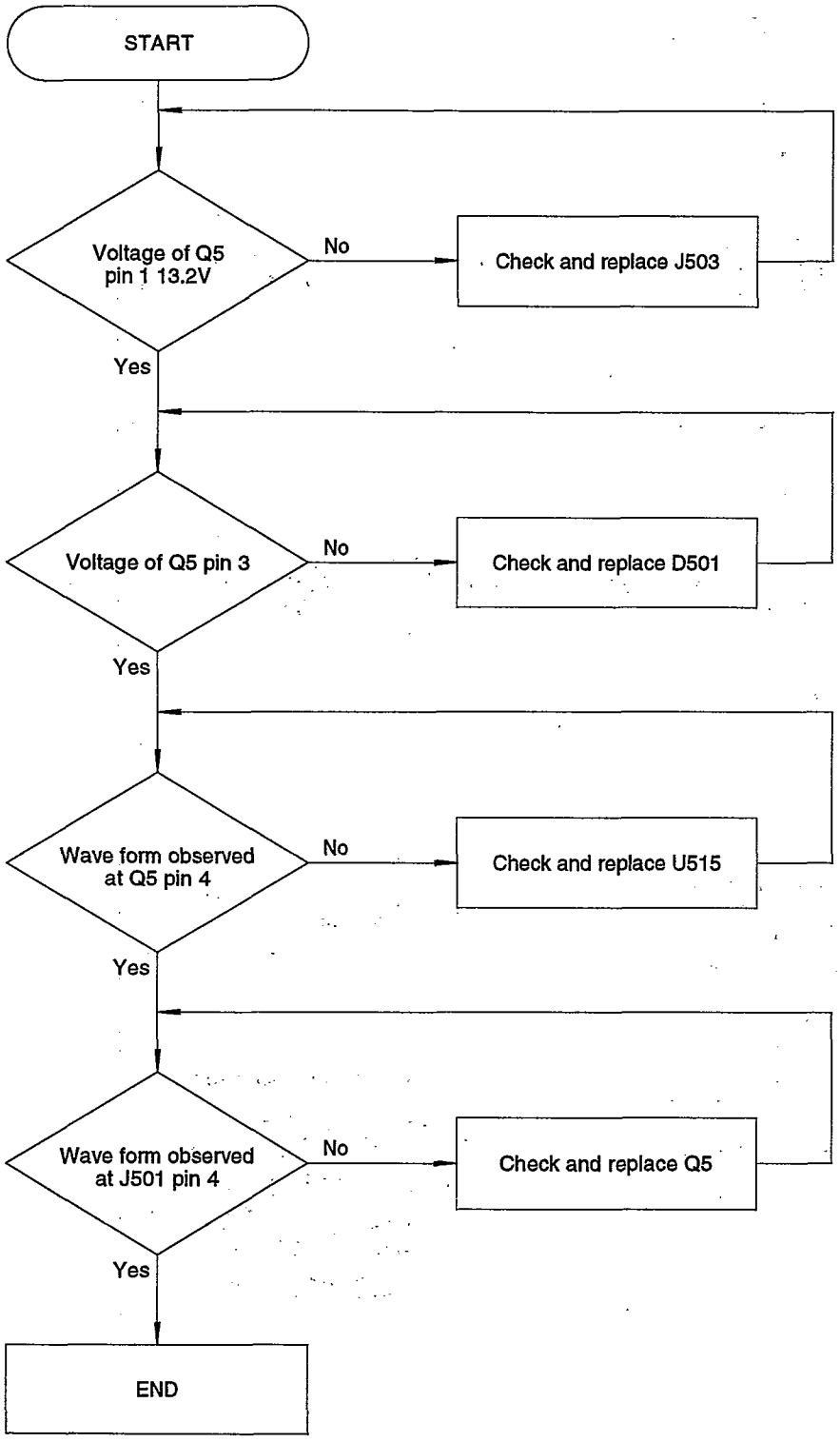
CODE	ERROR CONTENTS
OFF/ON 01	EEPROM check sum error
OFF/ON 02	Internal RAM READ/WRITE error
OFF/ON 03	External RAM READ/WRITE error
OFF/ON 04-09	Reserved
OFF/ON 10	Carrier control failure
OFF/ON 11	PLL unlock
OFF/ON 20	NAM virgin or sum check error
OFF/ON 21	SNROM virgin or sum check error
OFF/ON 22	EVR virgin or sum check error

4.3.1.3 "NO SERVICE" icon does no appear

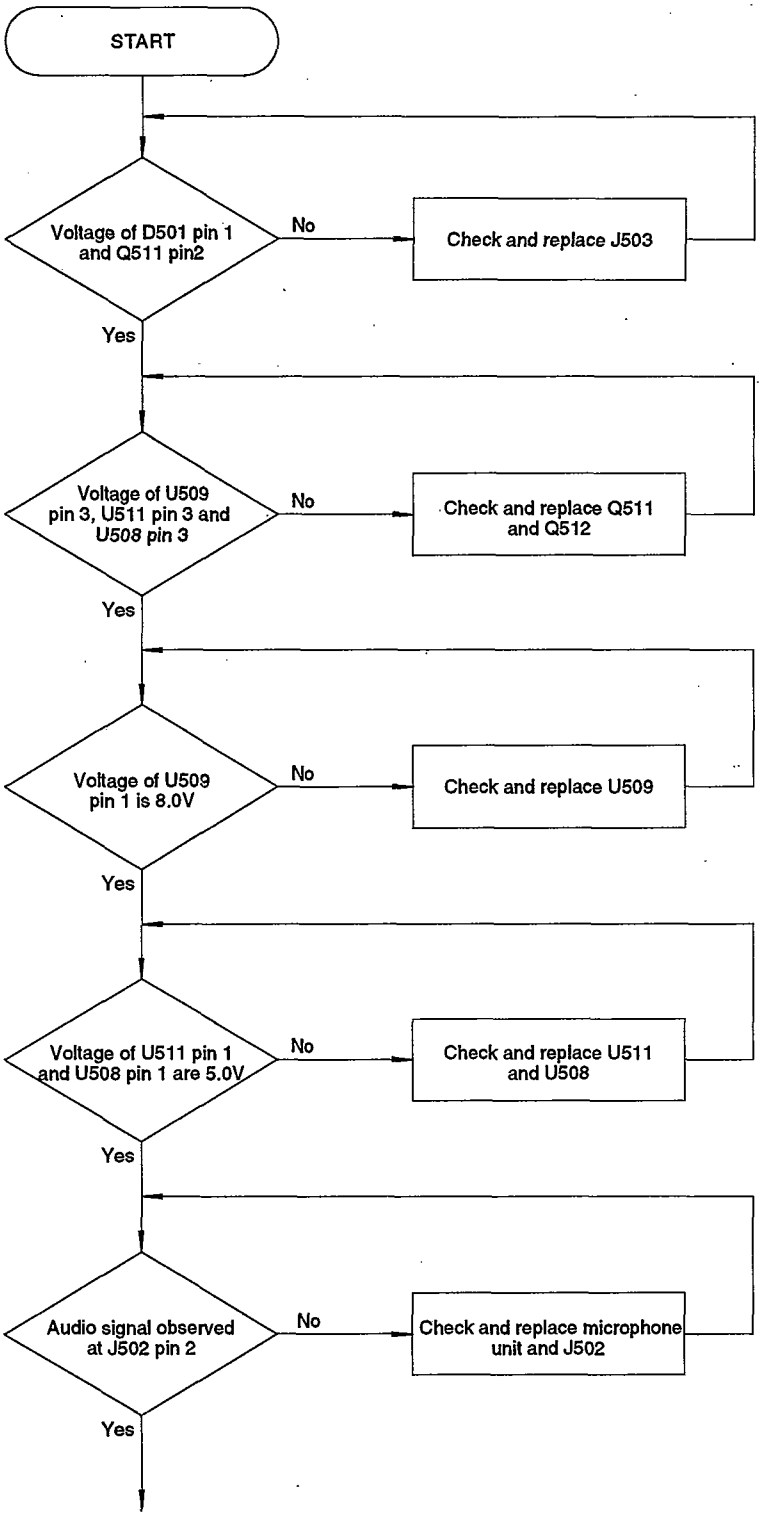

START
Correct NAM is selected and 2 NAMs are written
No
Select the other NAM by a key operation
Yes
A/B system selection suitable
No
Select a suitable mode of A/B system selection by a key operation
Yes
Waveform observed at U410 pin-39 of Test Point TP449
No
Check and replace antenna RF part and U410
Yes
Check and replace U407
END
U410 pin-39 Test Point TP449

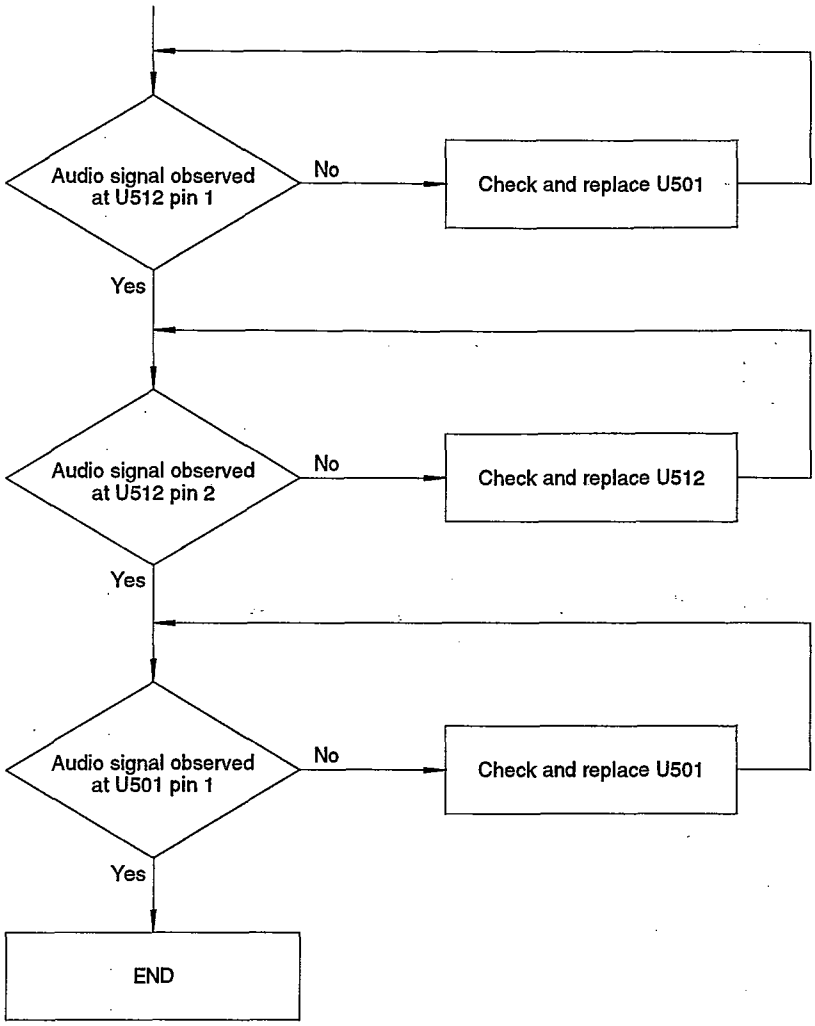
4.3.2 Car mount adaptor

4.3.2.1 DC power is not supplied to telephone

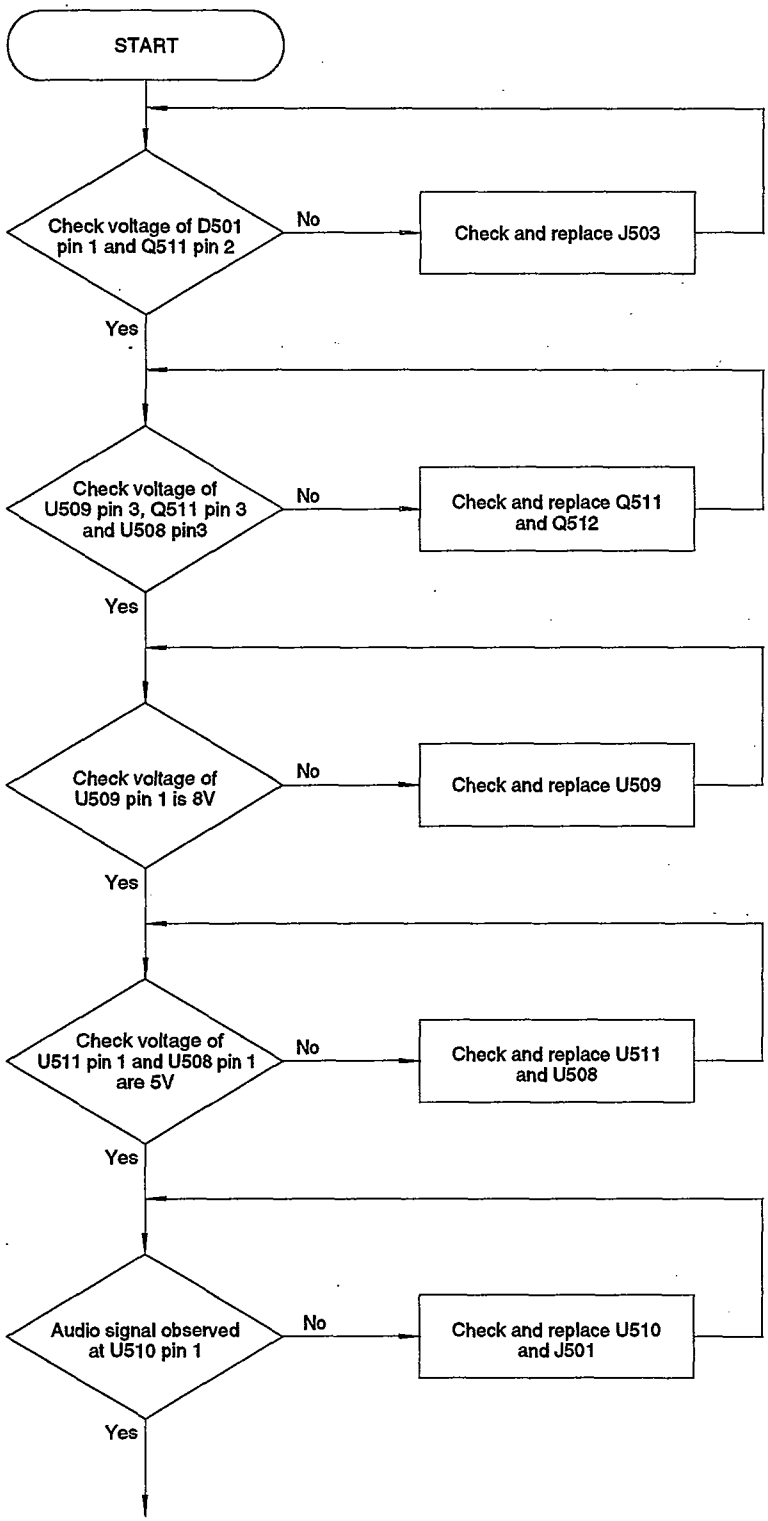


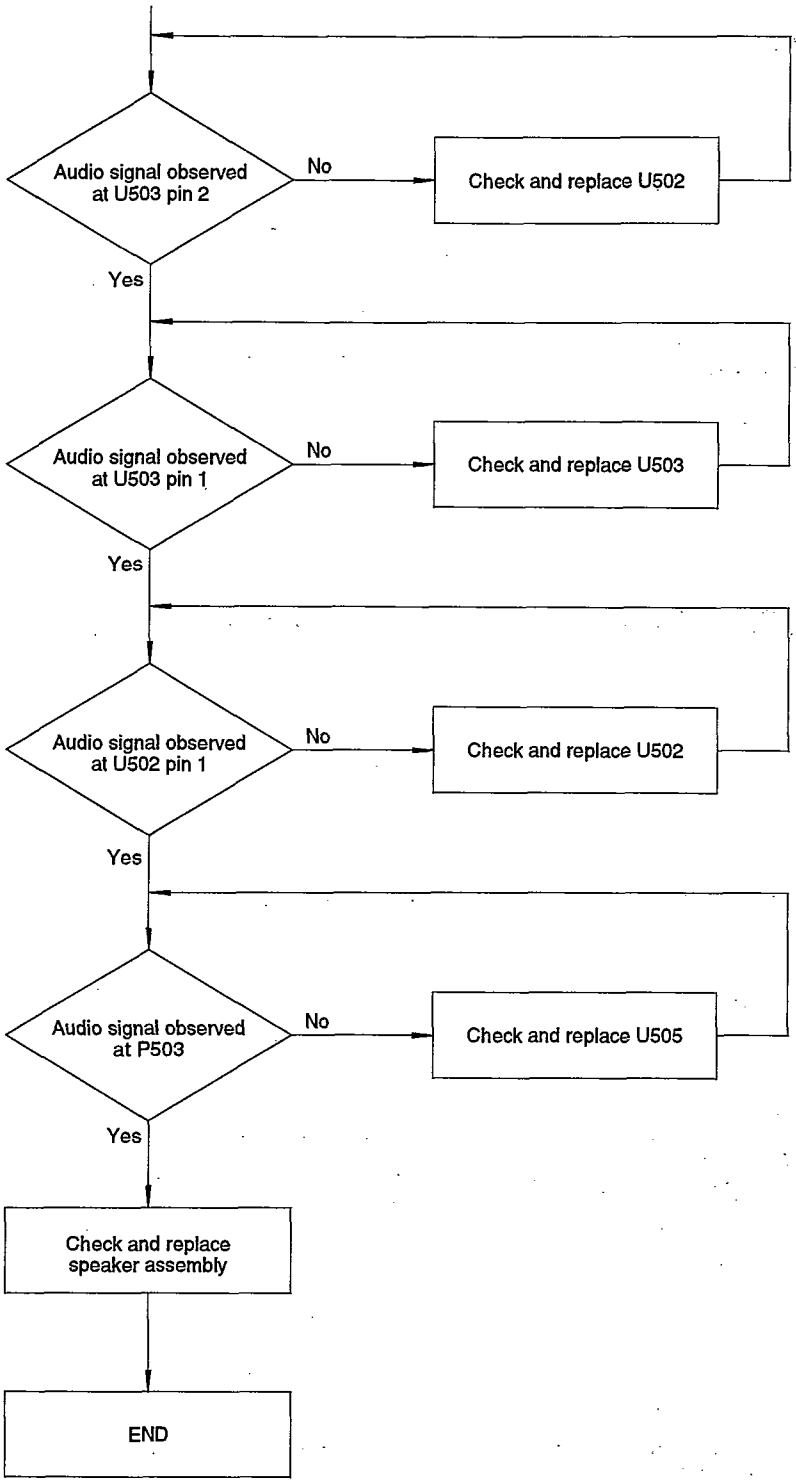
4.3.2.2 No Tx audio output


START
Voltage of D501 pin 1 and Q511 pin2
No
Check and replace J503
Yes
Voltage of U509 pin 3, U511 pin 3 and U508 pin 3
No
Check and replace Q511 and Q512
Yes
Voltage of U509 pin 1 is 8.0V
No
Check and replace U509
Yes
Voltage of U511 pin 1 and U508 pin 1 are 5.0V
No
Check and replace U511 and U508
Yes
Audio signal observed at J502 pin 2
No
Check and replace microphone unit and J502
Yes


Audio signal observed at U512 pin 1
No
Check and replace U501
Yes
Audio signal observed at U512 pin 2
No
Check and replace U512
Yes
Audio signal observed at U501 pin 1
No
Check and replace U501
Yes
END

4.3.2.3 No Rx audio output


START
Check voltage of D501 pin 1 and Q511 pin 2
No
Check and replace J503
Yes
Check voltage of U509 pin 3, Q511 pin 3 and U508 pin3
No
Check and replace Q511 and Q512
Yes
Check voltage of U509 pin 1 is 8V
No
Check and replace U509
Yes
Check voltage of U511 pin 1 and U508 pin 1 are 5V
No
Check and replace U511 and U508
Yes
Audio signal observed at U510 pin 1
No
Check and replace U510 and J501
Yes


Audio signal observed at U503 pin 2
No
Check and replace U502
Yes
Audio signal observed at U503 pin 1
No
Check and replace U503
Yes
Audio signal observed at U502 pin 1
No
Check and replace U502
Yes
Audio signal observed at P503
No
Check and replace U505
Yes
Check and replace speaker assembly
END

5 TEST COMMANDS

The transceiver can be tested by entering test commands from the key pad. The main CPU can also receive test commands through the serial interface described previously from an external test set.

5.1 Test Commands for Built-in Test

In order to enter test mode the following key operations are required.

1. Connect the measuring adaptor to the transceiver.
2. Enter [*] [0] [#] [0] [*] [0] [#] [0] [*] [3] (Password 3). Then enter Ⓕ Ⓜ.
   When an error code is displayed enter password 3.
3. "TEST MODE" is displayed on the LCD.
   In this condition it is possible to enter the test commands listed below.
4. To exit test mode enter [END].

No.	Command Name	Key Operation	Function
1	INIT	{[0]} [1] [SND] {[0]} can be omitted.	Initialises the equipment to the following state. 1. Carrier off 2. Tx PLL circuit off 3. Power level is set to 0 4. Rx-audio muted 5. Tx-audio muted 6. Signalling tone off 7. SAT off 8. DTMF and audio tones off 9. Compandor on 10. Backlight on 11. Buzzer off 12. RGC off 13. Charge on
2	CARRIER ON/OFF	{[0]} [2] [*] Y [SND] Y: 0 or 1	Turns the carrier on when the parameter is 1. Turns the carrier off when the parameter is 0.
3	LOAD-SYNTH	{[0]} [3] [*] {Y} {Y} {Y} {Y} [SND] YYYY: Channel No. (0000 to 0600 or 1329 to 2047)	Sets the synthesiser to the channel specified by the parameter.
4	SET ATTN	{[0]} [4] [*] Y [SND] Y:Power level (0 to 7)	Sets the power level to the value specified by the parameter.
5	Rx MUTE/ Rx UNMUTE	{[0]} [5] [*] Y [SND] Y: 0 or 1	Mutes the Rx-audio signal when the parameter is 0. Unmutes the Rx-audio signal when the parameter is 1.
6	Tx MUTE/ Tx UNMUTE	{[0]} [6] [*] Y [SND] Y:0 or 1	Mutes the Tx-audio signal when the parameter is 0. Unmutes the Tx-audio signal when the parameter is 1.
7	ST ON/OFF	{[0]} [7] [*] Y [SND] Y:0 or 1	Transmits a continuous signalling tone when the parameter is 1. Stops current transmission of signalling tone when the parameter is 0. ST ON/OFF, SAT ON/OFF, CARRIER ON/OFF, INIT, or STATUS command can be input while the signalling tone is being transmitted.

<table>
<tr><th>No.</th><th>Command Name</th><th>Key Operation</th><th>Function</th></tr>
<tr><td>8</td><td>SET UP</td><td>{0} 8 SND</td><td>Turns the carrier on at the start of transmission.
Transmits a 7-word Reverse Control Channel message. The DCC shall be 11 and each of the 7 words shall consist of the following data pattern: FF, 00, AA, 55, CC, 33.
Channel scan, busy-idle determination and BCH encoding are not performed.
Turns the carrier off at the termination.</td></tr>
<tr><td>9</td><td>VOICE</td><td>{0} 9 SND</td><td>Turns the carrier on at the start of transmission.
Transmits a 4-word Reverse Voice Channel message and each of the 4-words shall consist of the following data pattern: FF, 00, AA, 55, CC, 33.
Turns the carrier off at the termination.</td></tr>
<tr><td>10</td><td>INVM</td><td>1 0 SND</td><td>Initialises the NVM area as follows:
Set Lock State to Unlock and set NVM Test Pattern to FF, 00, AA, 55, CC, 33.
Set 0 to all the other area except Lock State, Key Tone ON/OFF, A/S System Select, Ring Volume, Key Volume, RCV volume and NVM Test Pattern.
Check all the contents in the NVM area.</td></tr>
<tr><td>11</td><td>SEND-SN</td><td>1 1 SND</td><td>Converts the contents of 4-byte serial number into 11-digit decimal code and display it on the LCD. Nothing is displayed when the serial number is wrong.
31 16 15 12 11 6 5 0
<table><tr><td>Equipment Serial Number (16 bit)</td><td>Reserved (4 bit)</td><td>Equipment Code (6 bit)</td><td>Manufacture Code (6 bit)</td></tr></table>
XXYYRRZZZZZ (11-digit decimal code)
XX: Convert the 6-bit Manufacturer Code into 2-digit decimal code (00 to 63).
YY: Convert the 6-bit Equipment Code into a 2-digit decimal code (00 to 63).
RR: Convert the 4-bit Reverse into 2-digit decimal code (00 to 15).
ZZZZZ: Convert the 15-bit Equipment Serial Number into 5-digit decimal code (00000 to 65535).</td></tr>
<tr><td>12</td><td>SAT ON/OFF</td><td>1 2 * Y SND
Y: 0, 1, 2, or 3
<table><tr><th>Y</th><th>SAT frequency</th></tr><tr><td>0</td><td>5970Hz</td></tr><tr><td>1</td><td>6000Hz</td></tr><tr><td>2</td><td>6030Hz</td></tr><tr><td>3</td><td>OFF</td></tr></table></td><td>When the parameter is 0, 1, or 2, starts to detect and filter the Rx SAT and turns the SAT transponder on.
The condition of Rx SAT can be monitored by STATUS command.</td></tr>
<tr><td>13</td><td>DTMF ON</td><td>1 3 * Y SND
Y: Digit key
(1 to 9, *, 0, #)</td><td>Starts DTMF transmission with the tones associated with the digit key specified by the 1-digit parameter. Also activates the external transmission of DTMF</td></tr>
<tr><td>14</td><td>DTMF OFF</td><td>1 4 SND</td><td>Stops DTMF transmission</td></tr>
<tr><td>15</td><td>ST-DTMF</td><td>1 5 * Y SND
Y:0 to 8
<table><tr><th>Y</th><th>Frequency</th></tr><tr><td>0</td><td>OFF</td></tr><tr><td>1</td><td>697Hz</td></tr><tr><td>2</td><td>770Hz</td></tr><tr><td>3</td><td>852Hz</td></tr><tr><td>4</td><td>941Hz</td></tr><tr><td>5</td><td>1150Hz</td></tr><tr><td>6</td><td>1209Hz</td></tr><tr><td>7</td><td>1336Hz</td></tr><tr><td>8</td><td>1477Hz</td></tr></table></td><td>When the parameter is 1 to 8, generates the tone associated with the frequency specified by the parameter. Also activates the external tone transmission.
When the parameter is 0, stops generating the tone.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Command Name</th><th>Key Operation</th><th>Function</th></tr>
<tr><td>16</td><td>MES-RSSI</td><td>[1] [6] [SND]</td><td>Displays the current RSSI value on the LCD formatted by 4-bit binary code. (0000 to 1111)</td></tr>
<tr><td>17</td><td>ZERO-CDATA</td><td>[1] [7] [SND]</td><td>Turns the carrier on at the start of transmission.
Transmits continuous 7-word Reverse Control Channel message.
The DCC shall be 10 and each of the 7 words shall consist of all zeros.
All frames shall start with Dotting and Word Sync.
Only INIT and STATUS commands can be received while transmitting continuous Reverse Control Channel message.</td></tr>
<tr><td>18</td><td>COMP ON/OFF</td><td>[1] [8] [*] Y [SND]
Y:0 or 1</td><td>Turns the compandor on when the parameter is 1 and turns the compandor off when the parameter is 0.</td></tr>
<tr><td>19</td><td>VERSION</td><td>[1] [9] [SND]</td><td>Converts the 5-byte software version using ASCII conversion and displays 5 characters on the LCD.</td></tr>
<tr><td>20</td><td>STATUS</td><td>[2] [0] [SND]
The 2nd/3rd lines of LCD are as follows:
WS CP CH
R1R2 – T1T2 – XXXX</td><td>Displays the following data out of the status information in the handheld equipment:
R_1:Word Sync. (1=ON)
R_2: Rx SAT Frequency
0=5970 Hz
1=6000 Hz
2=6030 Hz
3=OFF
T_1: Carrier Status (1=ON)
T_2: Power Level (0 to 7)
XXXX: Channel Number</td></tr>
<tr><td>21</td><td>DISP-ERCODE</td><td>[2] [1] [SND]
ERROR DISP
10 11</td><td>Displays the error codes of the failures that the equipment has ever detected on the LCD. The example on left shows that both the carrier on/off error (error code=10) and the PLL unlock (error code=11) have been detected.</td></tr>
<tr><td>22</td><td>CLEAR-ERCODE</td><td>[2] [2] [SND]</td><td>Clears the error information.</td></tr>
<tr><td>23</td><td>MIC ON/OFF</td><td>[2] [3] [*] Y [SND]
Y: 0 or 1
This command is not available when connected to handsfree cradle</td><td>Turns the microphone input on when the parameter is 1 and turns the microphone input off when the parameter is 0.
This command sets the audio path control in test mode as follows:
<table>
<tr><th>MUTE</th><th>MIC ON/OFF</th><th>Input from Microphone</th><th>Sound from Receiver</th></tr>
<tr><td>Tx MUTE/ Rx MUTE</td><td>Don't care</td><td>X</td><td>X</td></tr>
<tr><td>Tx UNMUTE/ Rx MUTE</td><td>ON</td><td>O</td><td>Don't care</td></tr>
<tr><td>Tx MUTE/ Rx UNMUTE
Tx UNMUTE/ Rx UNMUTE</td><td>OFF</td><td>X</td><td>Don't care</td></tr>
</table></td></tr>
<tr><td>24</td><td>ICAS</td><td>[2] [4] [SND]
Resets all the business memories.</td><td>Writes 00H data in all the area of the M-byte Business Memory and checks that the data is written correctly.</td></tr>
<tr><td>25</td><td>VOLUME CONTROL</td><td>[+] or [–]
This command is not available when connected to handsfree cradle and on-hook condition.</td><td>When both the Tx-audio and Rx-audio are muted, adjust the key confirmation tone from the receiver in handheld use.
When either the Tx-audio or Rx audio is unmuted, adjusts the receiver volume. This command is ignored when the transceiver is in car mount mode and on the cradle.
When the [+] or [–] key is pressed once the volume changes by 1 level.
Holding the key adjusts the volume level by 1 level per 1 second.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Command Name</th><th>Key Operation</th><th>Function</th></tr>
<tr><td>26</td><td>BACKLIGHT
ON/OFF</td><td>2 5 * Y SND
Y:0 or 1</td><td>Turns the backlight on when the parameter is 1.
Turns the backlight off when the parameter is 0.
In Handset Test mode, the backlight will be permanently on if "0" is not selected.</td></tr>
<tr><td>27</td><td>BUZZER
ON/OFF</td><td>2 6 * Y SND
Y:0, 1, 2, 3, 4 or 5
<table><tr><th>Y</th><th>Buzzer Volume</th></tr><tr><td>0</td><td>OFF</td></tr><tr><td>1</td><td>Level 1</td></tr><tr><td>2</td><td>Level 2</td></tr><tr><td>3</td><td>Level 3</td></tr><tr><td>4</td><td>Level 4</td></tr><tr><td>5</td><td>Level 5</td></tr></table></td><td>When the parameter is 1, 2, 3, 4 or 5, starts buzzer tone transmission with the volume level specified by the parameter.
Selects 0 to disable the buzzer tone.</td></tr>
<tr><td>28</td><td>RCV ON/OFF</td><td>2 8 * Y SND</td><td>Turn the receiver output on when the parameter is 1.
Turn the receiver output off when the parameter is 0.</td></tr>
<tr><td>29</td><td>MESS-BATT</td><td>2 9 SND
XY – ZZ – TTVV</td><td>Display the battery information on the LCD.
X: Battery ID
0 = dry battery Pack
1 = NiCd 900mA/NiCd 600 mA
Y:Battery Level (0 to 45.0 = Low Battery)
ZZ:Battery Voltage (0 to FF(HEX))
TT: Temperature (0 to FF(HEX))
VV: -ΔV detection battery voltage (00 to FF(HEX))</td></tr>
<tr><td>30</td><td>CHARGE
ON/OFF</td><td>3 0 * Y</td><td>Turn charging switch on when the parameter is 1.
Switch off is 0
Battery charge control command.
0 = Charge off
1 = Charge on (continuous charge)
2 = Charge on (trickle charge)
3 = Charge on (complementary charge).</td></tr>
</table>

5.2 Test Commands for an External Test

In order to enter the test mode the TEST MODE selection command must be entered. When in test mode the test command listed below can be entered.
To exit test mode the mode selection commands must be entered.

No.	Command Name	OP Code	Number of additional data bytes	Number of returned command data bytes	Function
1	INIT		0	0	Initialises the equipment to the following state: 1. Carrier off 2. Tx PLL circuit off 3. Power level is set to 0 4. Rx-audio muted 5. Tx-audio muted 6. Signalling tone off 7.SAT off 8. DTMF and audio tones off 9. Compandor on 10. Backlight on 11. Buzzer off 12.RGO off 13. Charge on
2	CARRIER ON/OFF		1	0	Turns the carrier on when the parameter is 01H. Turns the carrier off when the parameter is 00H.
3	LOAD-SYNTH		2	0	Sets the synthesiser to the channel specified by the parameter.
4	SET ATTN		1	0	Sets the power level to the value specified by the parameter.
5	Rx MUTE/ Rx UNMUTE		1	0	Mutes the Rx-audio signal when the parameter is 00H. Unmutes the Rx-audio signal when the parameter is 01H.
6	Tx MUTE/ Tx UNMUTE		1	0	Mutes the Tx-audio signal when the parameter is 00H. Unmutes the Tx-audio signal when the parameter is 01H.
7	ST ON/OFF		1	0	Transmits a continuous signalling tone when the parameter is 01H. Stops current transmission of signalling tone when the parameter is 00H. ST on/off, SAT on/off, Carrier on/off, INIT, Status, or 4-kind Mode Selection commands can be input while the signalling tone is being transmitted.
8	SET UP		0	0	Turns the carrier on at the start of transmission. Transmits a 7-word Reverse Control Channel message. The DCC shall be 11 and each of the 7 words shall consist of the following data pattern:FF, 00, AA, 55, CC, 33. Channel scan, busy-idle determination and BCH encoding are not performed. Turns the carrier off at the termination.
9	VOICE		0	0	Turns the carrier on at the start of transmission. Transmits a 4-word Reverse Voice Channel message and each of the 4 words shall consist of the following data pattern: FF, 00, AA, 55, CC, 33. Turns the carrier off at the termination.
10	VERSION		0	5	Returns the 8-byte DATA command including the 5-byte software version with the lower address first.

No.	Command Name	OP Code	Number of additional data bytes	Number of returned command data bytes	Function
11	MON-IN		0	2	Reads the input ports and returns the 5-byte DATA command including the data which has been formatted as follows: Byte 1 MSB LSB 7 6 5 4 3 2 1 0 EXT Power on/off (1=ON) ML/HH (1=ML) Ignition on/off (1=ON) SAT lock (1=LOCK) Not used Not used Tx lock Det. (1=ON) Rx lock Det. (1=ON) Byte 2 MSB LSB 7 6 5 4 3 2 1 0 Not used Battery type (1=NiCd) Not used Not used Earphone mic (1=ON) Not used Not used Not used
12	MON-OUT		1	0	Outputs to the port specified by the received data.
13	RNVM		0	240	Reads 240 byte non-volatile memory and returns the 243 byte DATA command including the non-volatile memory to the Test Set with the lower address first.
14	WNVM		240	0	Writes the received N byte non-volatile memory to the NVM area.
15	INVM		0	0	Initialises NVM area as follows: Sets Lock State to Unlock and sets NVM Test Pattern to FF, 00, AA, 55, CC, 33. Sets 0 to all the other area except Lock State, Key Tone ON/OFF, A/B System select, Ring volume, Key volume, RCV volume and NVM test pattern. Checks all the contents in the NVM area.
16	SEND-SN		0	4	Returns the 7-byte DATA command including the 4-byte serial number to the Test Set with the lower address first.
17	SAT ON/OFF		1	0	When the parameter is 1AH, 11H or 12H, starts to detect and filter the Rx SAT and returns the SAT transponder on. The condition of Rx SAT can be monitored by STATUS command. When the parameter is 13H, turns the SAT transponder off and stops detecting and filtering the Rx SAT.

<table>
<tr><th>No.</th><th>Command Name</th><th>OP Code</th><th>Number of additional data bytes</th><th>Number of returned command data bytes</th><th>Function</th></tr>
<tr><td>18</td><td>DTMF</td><td></td><td>1</td><td>0</td><td>Starts DTMF transmission with the tones specified by the 1-byte parameter. Also activates the external transmission of DTMF.
<table>
<tr><th>BYTE 1</th><th>Frequency</th></tr>
<tr><td>11H</td><td>1209Hz and 697Hz(1)</td></tr>
<tr><td>12H</td><td>1336Hz and 697Hz (2)</td></tr>
<tr><td>13H</td><td>1477Hz and 697Hz (3)</td></tr>
<tr><td>14H</td><td>1209Hz and 770Hz (4)</td></tr>
<tr><td>15H</td><td>1336Hz and 770Hz (5)</td></tr>
<tr><td>16H</td><td>1477Hz and 770Hz (6)</td></tr>
<tr><td>17H</td><td>1209Hz and 852Hz (7)</td></tr>
<tr><td>18H</td><td>1366Hz and 852Hz (8)</td></tr>
<tr><td>19H</td><td>1477Hz and 852Hz (9)</td></tr>
<tr><td>1BH</td><td>1209Hz and 941Hz (*)</td></tr>
<tr><td>1AH</td><td>1336Hz and 941Hz (0)</td></tr>
<tr><td>1CH</td><td>1477Hz and 941Hz (#)</td></tr>
</table></td></tr>
<tr><td>19</td><td>DTMF</td><td></td><td>0</td><td>0</td><td>Stops DTMF transmission.</td></tr>
<tr><td>20</td><td>ST-DTMF</td><td></td><td>1</td><td>0</td><td>When the parameter is 11H to 18H, generates the tone associated with the frequency specified by the parameter and also activates the external tone transmission. When the parameter is 1AH stops generating the tone.
<table>
<tr><th>BYTE 1</th><th>Frequency</th></tr>
<tr><td>1AH</td><td>OFF</td></tr>
<tr><td>11H</td><td>697Hz</td></tr>
<tr><td>12H</td><td>770Hz</td></tr>
<tr><td>13H</td><td>852Hz</td></tr>
<tr><td>14H</td><td>941Hz</td></tr>
<tr><td>15H</td><td>1150Hz</td></tr>
<tr><td>16H</td><td>1209Hz</td></tr>
<tr><td>17H</td><td>1336Hz</td></tr>
<tr><td>18H</td><td>1477Hz</td></tr>
</table></td></tr>
<tr><td>21</td><td>MES-RSSI</td><td></td><td>0</td><td>1</td><td>Returns the 4-byte DATA command including the 1-byte RSSI value formatted as follows:
<table>
<tr><td>MSB</td><td></td><td></td><td></td><td></td><td></td><td></td><td>LSB</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>R3</td><td>R2</td><td>R1</td><td>R0</td></tr>
</table>
R3 .... R0: RSSI value (in binary).</td></tr>
<tr><td>22</td><td>ZERO-CDATA</td><td></td><td>0</td><td>0</td><td>Turns the carrier on at the start of transmission.
Transmits continuous 7-word Reverse Control Channel message.
The DCC shall be 10 and each of the 7 words shall consist of all zeros. All frames shall start with Dotting and Word Sync.
Only INIT, STATUS and 4-kind Mode Selection commands can be input while transmitting continuous Reverse Control Channel message.</td></tr>
<tr><td>23</td><td>COMP ON/OFF</td><td></td><td>1</td><td>0</td><td>Turns the compandor on when the parameter is 01H and turns the compandor off when the parameter is 00H.</td></tr>
<tr><td>24</td><td>SEND-NAM 1</td><td></td><td>0</td><td>32</td><td>Returns the 35-byte DATA command including the 32-byte NAM contents to the Test Set.</td></tr>
<tr><td>25</td><td>SEND-NAM 2</td><td></td><td>0</td><td>32</td><td>Returns the 35-byte DATA command including the 32-byte NAM contents to the Test Set.</td></tr>
<tr><td>26</td><td>ICAS</td><td></td><td>0</td><td>0</td><td>Writes 00H data to all the area of the M-byte Business Memory and checks that the data is written correctly.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Command Name</th><th>OP Code</th><th>Number of additional data bytes</th><th>Number of returned command data bytes</th><th>Function</th></tr>
<tr><td>27</td><td>STATUS</td><td></td><td>0</td><td>4</td><td>Returns the 7-byte DATA command including the 4-byte data shown as follows:
<table><tr><th>BIT</th><th>MSB</th><th></th><th></th><th></th><th></th><th></th><th></th><th>LSB</th></tr><tr><td>Byte 1</td><td>S7</td><td>S6</td><td>S5</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td><td>S0</td></tr><tr><td>Byte 2</td><td>C1</td><td>C2</td><td>0</td><td>CARR</td><td>TN</td><td>S10</td><td>S9</td><td>S8</td></tr><tr><td>Byte 3</td><td>PL2</td><td>PL1</td><td>PL0</td><td>B1</td><td>MODE</td><td>WS</td><td>RxM</td><td>TxM</td></tr><tr><td>Byte 4</td><td>0</td><td>0</td><td>COM</td><td>TxSAT</td><td>R3</td><td>R2</td><td>R1</td><td>R0</td></tr></table>S10 .... S0: Channel number (binary coded)
PL2 .... PL0: Power level (0 to 7)
CARR: Carrier status (1=ON)
TN: Signal tone (1=ON)
TxM: Transmit-audio mute (1=MUTED)
RxM: Receive-audio mute (1=MUTED)
WS: Word synchronisation (1=ON)
MODE: Current WBD Rx mode (1=C-CH, 0=V-CH)
B1: Current busy-idle bit state (1=IDLE, 0=BUSY)
C1, C2: Rx SAT frequency encoded as follows:
<table><tr><th>C1 C2</th><th>Frequency</th></tr><tr><td>0</td><td>5970Hz</td></tr><tr><td>1</td><td>6000Hz</td></tr><tr><td>2</td><td>6030Hz</td></tr><tr><td>3</td><td>No valid SAT</td></tr></table>R3 .... R0: RSSI value (binary coded)
COM: Compandor (1=ON)
Tx SAT: SAT transpondor (1=ON)</td></tr>
<tr><td>28</td><td>TURNAROUND</td><td></td><td>1</td><td>1</td><td>Returns the 4-byte data command including the received 1-byte parameter data to the Test Set.</td></tr>
<tr><td>29</td><td>MIC ON/OFF</td><td></td><td>1</td><td>0</td><td>When the received MIC control parameter is 01H, turns the microphone input on. When the parameter is 00H turns the microphone input off.
This command is available in handheld use W/ and W/O DC Adaptor and car mount use.</td></tr>
<tr><td>30</td><td>VOLUME</td><td></td><td>1</td><td>0</td><td>When both the Tx-audio and Rx-audio are muted adjusts the key confirmation tone from the receiver in handheld use or from the receiver in handheld use or from the Handsfree speaker in car mount use.
When either the Tx-audio or Rx-audio is unmuted, adjusts the receiver volume from the receiver in handheld use and in car mount use which isn't settle on the cradle, this command is neglected.
Volume adjustment is performed once when the command is input.</td></tr>
<tr><td>31</td><td>HEATRUN</td><td></td><td>0</td><td>0</td><td>1. Sets the synthesiser to the current channel and turns the carrier on with the current power level.
2. Wait for 40 seconds.
3. Turns carrier off and turns PLL circuit off.
4. Wait for 20 seconds.
(During this operation all other commands are ignored.)</td></tr>
<tr><td>32</td><td>MON-ER CODE</td><td></td><td>0</td><td>2</td><td>Returns the 5-byte data command including 2-byte parameter data to the test set.
Byte 1 Y1
Byte 2 Y2
Y1: The numbers of Carrier ON/OFF Error
Y2: The numbers of PLL Unlock Error.</td></tr>
</table>

No.	Command Name	OP Code	Number of additional data bytes	Number of returned command data bytes	Function
33	CLEAR-ER CODE		0	0	Clears the information about the numbers of Carrier ON/OFF Error and PLL Unlock Error in non-volatile memory.
34	CHK-MEM		16	0	1. Writes AAH data to the Nth address which is indicated by received data byte. Byte (2N-1) Y1 Byte (2N) Y2 Y1, Y2: Nth Address N = 1 - 8 2. Checks the Nth address whether data AAH can be written or not. 3. Writes 55H data to the Nth address. 4. Checks the Nth address whether data 55H can be written or not. 5. These process 1 - 4 shall be operated from N = 1 to N = 8.
35	BACKLIGHT ON/OFF		1	0	Turns the backlight on when the parameter is 01H. Turns the backlight off when the parameter is 00H. (In test set-test mode, the backlight shall be turned off as long as this command is operated.)
36	BUZZER ON/OFF		1	0	When the received parameter is 1, 2, 3, 4 or 5, starts the buzzer tone transmission with the volume level specified by the parameter. When the parameter is 0, stops the buzzer tone transmission. Byte 1 Y Byte 2Y 0 OFF 1 Buzzer volume level 1 2 Buzzer volume level 2 3 Buzzer volume level 3 4 Buzzer volume level 4 5 Buzzer volume level 5
37	RGC-ON/OFF		1	0	Turns the RGC on, when the parameter is 01H. Turns the RGC off.
38	RCV ON/OFF		1	0	Turn the receiver output on when the parameter is 1. Turns the receiver output off when the parameter is 0.
39	MESS-BATT		0	5	Return the 7-byte data command including 4 bytes parameter data to the test set. Y1 Y2 Y3 Y4 Y5 Y1: Battery ID 0 = Dry battery pack 1 = NiCd 900 mAh/NiCd 600mAh battery Y2: Battery level (0.0 to 4.0) Y3: Battery voltage (0 to FF - Hex) Y4: Temperature (0 to FF - Hex) Y5: -ΔV detection battery voltage (0 to FF - Hex) This command is only available during handheld use.
40	CHARGE ON/OFF		1	0	Battery charge control command. 00: charge OFF 01: charge ON (continuous charge) 02: charge ON (trickle charge) 03: charge ON (complementary charge).

6 ADJUSTMENT AND SERVICE

6.1 Before Adjustment

Test equipment

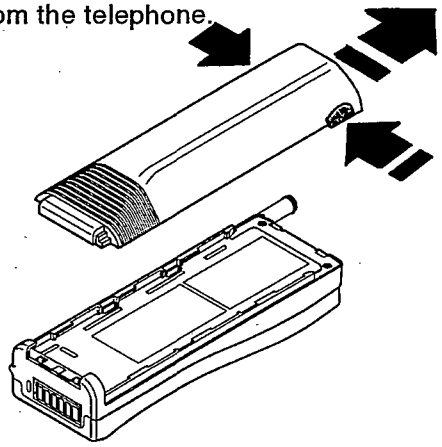
The following equipment, repair cables and connectors are needed for adjustment.

Equipment	Function	Recommended Model Number and Description
Cellular testers	Measuring sensitivity, frequency, power, modulation and signal-to-noise. Test call processing.	Marconi model 2955 Radio Communications test set model 2960 TACS adapter or equivalent
Dual trace oscilloscope	Observing wave forms	Up to 30MHz
Spectrum analyser (optional)	TX unit synthesiser analysis. Checking for spurious oscillations.	up to 1GHz
Regulated power supply	Provides DC power.	13.8V 5A metered
Measuring adapter	Measuring sensitivity, frequency, power, modulation and signal-to-noise.	
Jig 1	Replacing printed circuit boards and antenna.	

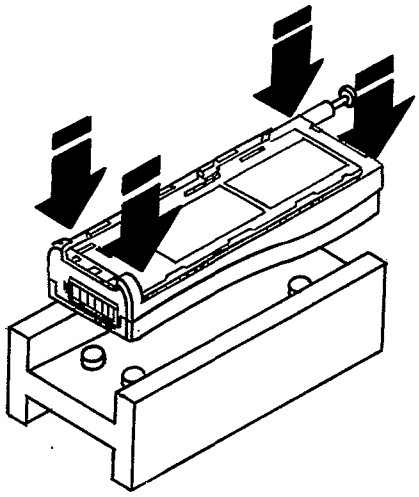
6.2 Disassembly and Assembly

6.2.1 Disassembly

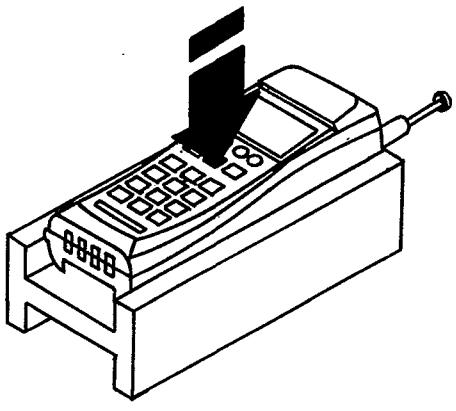
1. Remove the battery by pressing the 2 battery release latches and then sliding the battery towards the antenna. Lift the battery from the telephone.



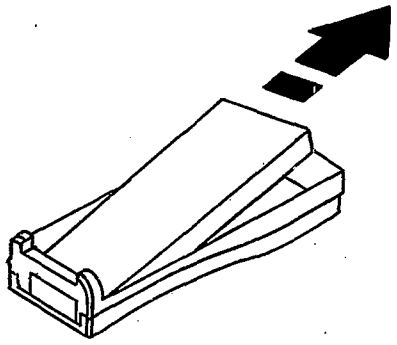
2. Fully extend the antenna.
3. Position the disassembly jig so that the board removal blades are facing downwards.
   Place the telephone on to the disassembly jig face down with the antenna towards the 'TOP' identification and the bottom against the locating pin. Press the telephone in all 4 corners until the back becomes unclipped from the main body.
   To remove the back from the main body, lift it away from the telephone and pull it towards the antenna.



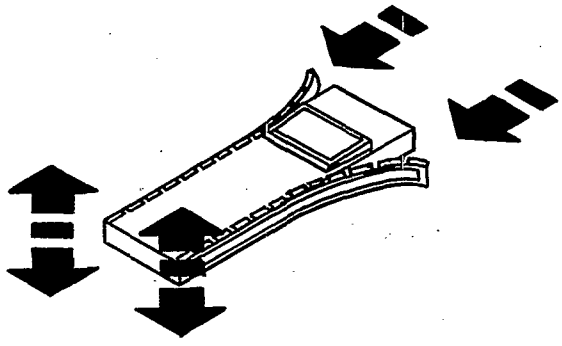
4. Turn the disassembly jig over so that the board removal blades are facing upwards.
   Place the telephone onto the board removal blades face up with the antenna towards the 'TOP' identification and against the locating pin. Press the telephone onto the board removal blades.
   Apply pressure to the CLR button and the PCB assembly will drop from the main unit.



5. Remove the PCB assembly by lifting it from the casing and sliding it towards the antenna.

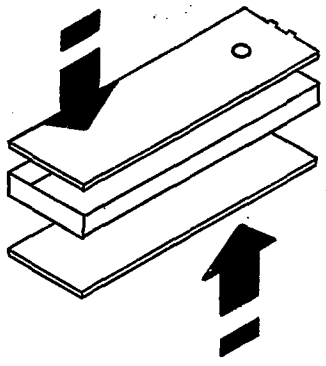


6. To disassemble the PCB assembly remove the PCB spring clips from both sides and ease apart the 2 PCBs at the bottom ensuring that you do not damage the RF/CONTROL interface connector.

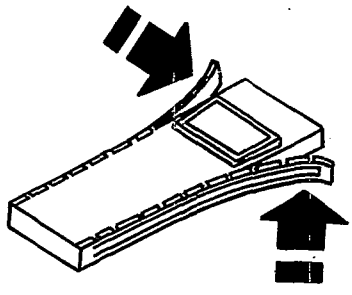


6.2.2 Assembly

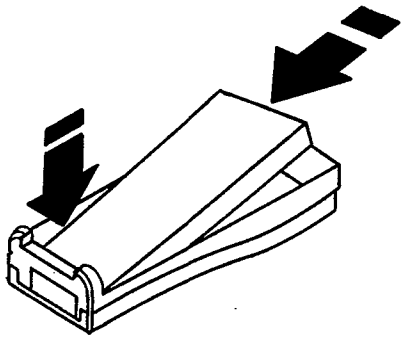
1. Locate the RF shield onto the RF board using the locating pin on the casting and the hole in the RF PCB. Connect the CONTROL board to the RF board ensuring that the RF/CONTROL interface connector is correctly pressed home.



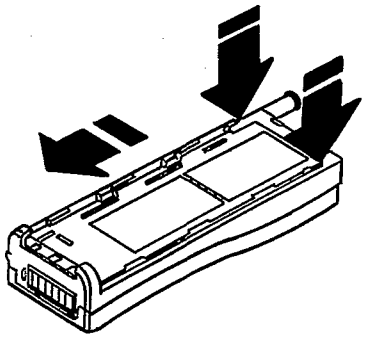
2. Push the PCB assembly clips onto the PCB assembly, with the locating pins on the casting correctly positioned over the holes in the clips. The clip that will be next to the antenna, when fully assembled, has an insulating strip attached down the spine.



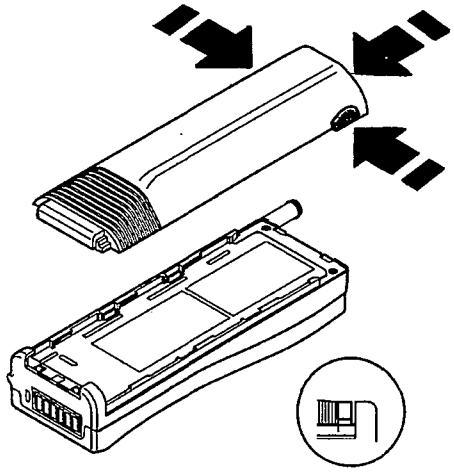
3. Verify that the keyboard membrane is in place correctly and locate the PCB assembly into the telephone body moulding. Place the bottom into the telephone moulding then push the PCB assembly home ensuring that the moulding clips are holding the PCB assembly correctly.



4. Place the back of the telephone on the main body bottom first, then clip the back into position.



5. Place the battery on the back of the telephone, positioned approximately 1cm from the lower battery retainers. Slide the battery towards the lower battery retainers until it locks into position.



6. Switch the telephone on as an initial test that it is assembled correctly.

6.3 Electronic Volume Adjustment

6.3.1 Adjustment commands from the keypad

6.3.1.1 Application

This specification is applied to the adjustment of 10 kinds of electronic gain control level for the J-series hand held cellular telephone.

5.3.1.2 How to enter adjustment mode

The unit under test (UUT) has several kinds of modes; normal mode, test set mode, test set adjustment mode and handset test mode. In this section you will use the "test set adjustment mode". This mode has functions to adjust the 10 electronic volumes under the control of the keypad.

6.3.1.3 Entering adjustment mode

Before adjustment.

1. Remove the battery from the unit or make sure that battery is not installed.
2. Apply +12V source DC. Turn on the power switch of the measuring adapter.
3. Enter ✱ 0 # 0 ✱ 0 # 0 ✱ 4 (Password 4) and then Ⓕ Ⓜ. The display shall indicate "ADJ Mode".
4. For level and frequency adjustment use ⊞ or ⊟ key.

6.3.1.4 Adjustment procedure

SET-PL: Transmitter power level setting

1. Enter 1 ✱ Y1 SND into the UUT.

Y1	Power Level Control Data
0	power level 0 adjust
1	power level 1 adjust
2	power level 2 adjust
3	power level 3 adjust
4	power level 4 adjust
5	power level 5 adjust
6	power level 6 adjust
7	power level 7 adjust

   The channel is automatically set to "1".
   Power level at 0, 1 and 2 are set to the same electronic volume level as level 2.
2. Adjust the power level in accordance with the following table.

Y1	Power level	Nominal		Tolerance	
		dBm	mWatts	Min (mWatts)	Max (mWatts)
2	2	+27.8	600 (478)	300	759
3	3	+23.8	240 (190)	120	302
4	4	+19.8	95.5 (75.8)	48	120
5	5	+15.8	38.0 (30.16)	19	47.9
6	6	+11.8	15.1 (12.0)	7.5	19.10
7	7	+7.8	6.03 (4.76)	3.0	7.56

The RF power level through the measuring adapter is 1.0dB less than values as shown in this table. Shown in brackets are the typical adjustment points.

3. Enter Ⓜ to store the data.
2. Set the modulation analyser filter to 300Hz to 15kHz.
   Adjust the deviation to 6.1kHz ±0.1kHz
3. Enter Ⓜ to store the data.
4. Set the power level by using the same steps as 1 and 2 above.
5. After the adjustments are complete press END to exit this mode.

SET-MDEV: Setting of deviation

1. Enter 2 SND into the UUT.
   The UUT will be set to:
   operating channel = 1ch
   carrier = ON
   Tx audio = UNMUTE
   compandor = OFF
   power level = 0
   microphone = OFF
2. Set the modulation analyser filter for 50Hz to 15kHz.
   Apply 1kHz, +1dBV (1.12V rms) signal to Tx audio terminal.
3. Adjust the deviation to 8.2kHz ±1.2kHz.
4. Enter Ⓜ to store the data and finish the adjustment.

SET-SDEV: Setting of standard deviation

1. Enter [3] [SND] into the UUT.
   The UUT will be set to:
   operating channel = 1ch
   power level = 0
   carrier = ON
   Tx audio = UNMUTE
   compandor = ON
   microphone = OFF
2. Set the modulation analyser filter to 300Hz to 3kHz.
   Apply 1kHz, -20dBV (100mV rms) signal from Tx audio terminal.
3. Adjust the deviation to 2.3kHz ±0.1kHz.
4. Enter [M] to store the result and finish the adjustment.

SET-WBD: Setting wide band data deviation

1. Enter [4] [SND] into the UUT.
   The UUT will be set to:
   operating channel= 1ch
   power level = 0
   carrier = ON
   wide band data activate
2. Set the modulation analyser filter to 300Hz to 15kHz.
   Adjust the deviation to 6.1kHz ±0.1kHz
3. Enter [M] to store the result and finish the adjustment.

SET-SAT: Setting of SAT deviation

1. Enter [5] [SND] into the UUT.
   The UUT will be set to:
   operating channel = 1ch
   power level = 0
   carrier = ON
   SAT colour code = 6000Hz
   SAT transponder = ON
2. Set the modulation analyser filter to 300Hz to 15kHz.
   Adjust the deviation to 1.7kHz ±0.1kHz
3. Enter [M] to store the result and finish the adjustment.

SET-DTMF: Setting of DTMF deviation

1. Enter [6] [SND] into the UUT.
   The UUT will be set to:
   operating channel= 1ch
   power level = 0
   carrier = ON
   941Hz single tone active
2. Set the modulation analyser filter to 300Hz to 15kHz.
   Adjust the deviation to 1.49kHz ±0.1kHz
3. Enter [M] to store the result and finish the adjustment.

SET-RxAUDIO: Setting of receive audio level

1. Enter [7] [SND] into the UUT.
   The UUT will be set to:
   operating channel = 1ch
   Rx audio = UNMUTE
   compandor = ON
   receiver = OFF
2. Set the signal generator output to 935.0125MHz
   FM deviation = 2.3kHz at 1kHz
   output power = -50dBm
   Apply the output to the UUT.
3. Adjust the receive audio output to -25dBV (55mV rms) ±0.5dB
4. Enter [M] to store the result and finish the adjustment.

SET-VREF: Setting of reference voltage

1. Apply 4.800v ±10mV at battery terminal of the unit.
   Do not use the clip fro battery terminal connection to prevent it from damage.
2. Enter [8] [SND] into the UUT.
3. Set the value of the display to 125 or 126 by using the [+] or [−].
4. Enter [M] to store the result and finish the adjustment.

SET-AFC: TCXO frequency tuning voltage setting

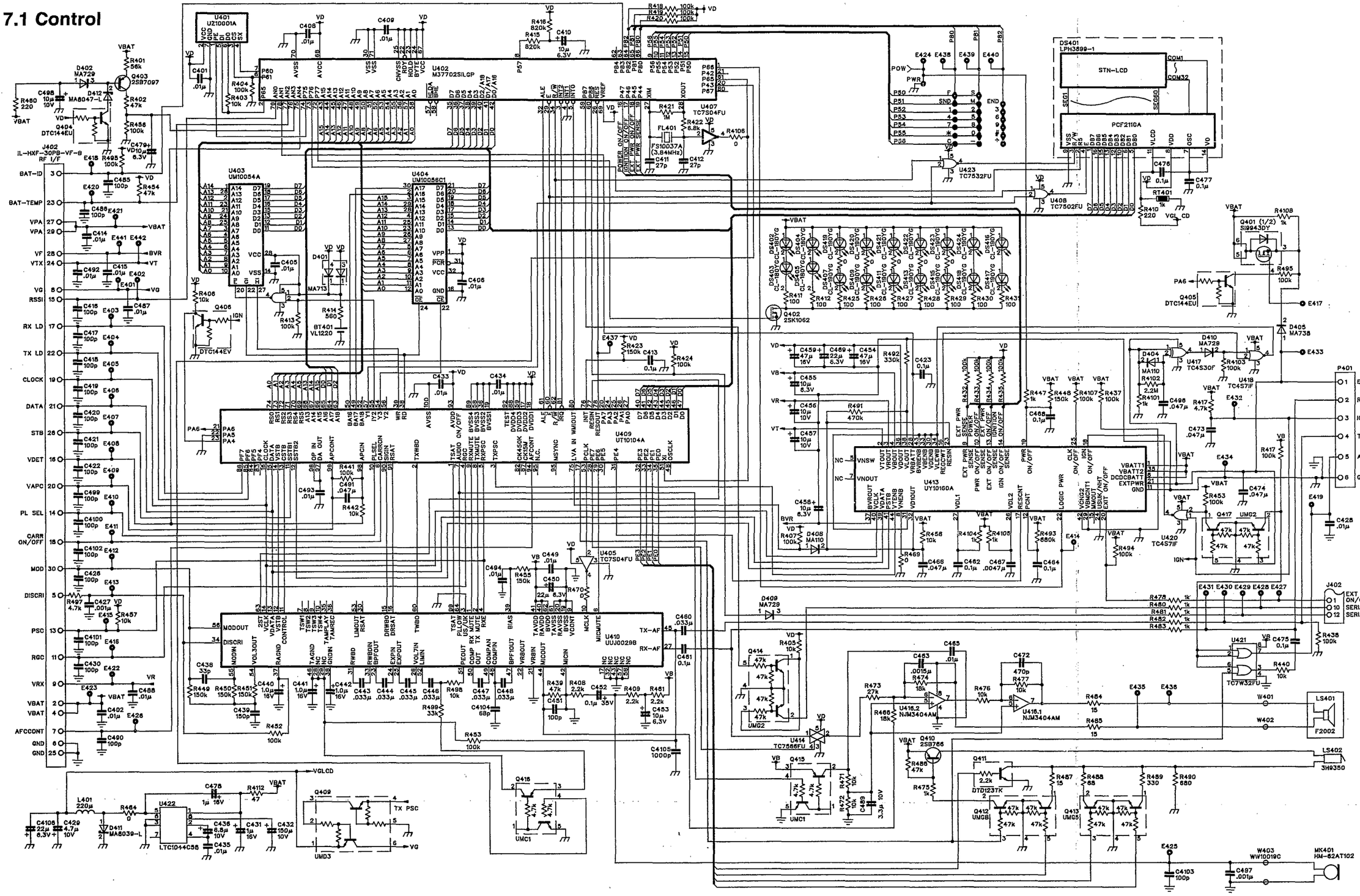
1. Enter [9] [SND] into the UUT.
   The UUT will be set to:
   operating channel = 1ch
   power level = 0
   microphone = OFF
   carrier = ON
   Tx audio = MUTE
2. Monitor Tx carrier frequency using a frequency counter.
3. Adjust the frequency to 890.0125MHz ±178Hz
4. Enter [M] to store the data and finish the adjustment.

SET-RSSI: Complement the RSSI curve slope

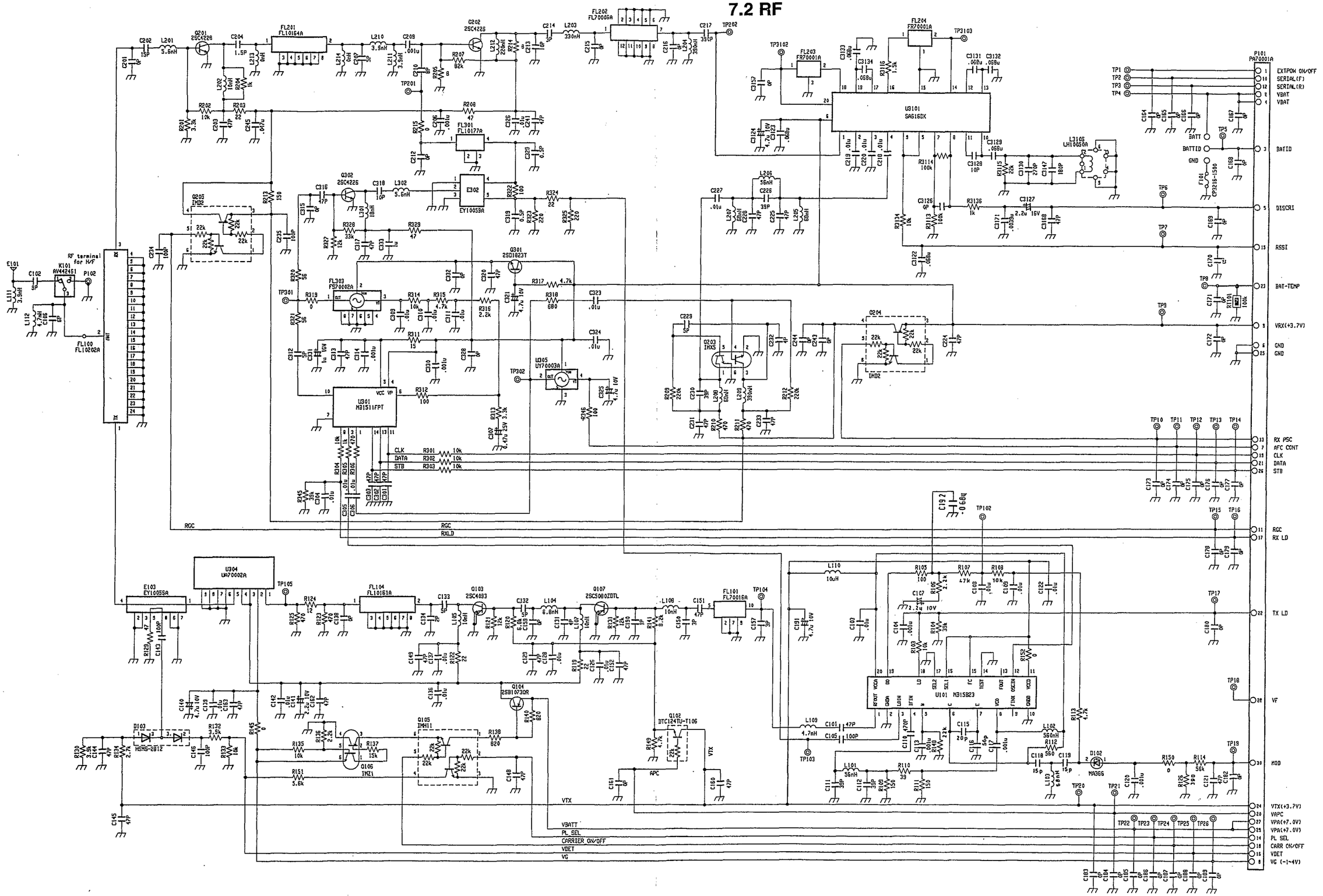
1. Apply f_{RX} (935.0125MHz), -93dBm, unmodulated signal to the UUT.
2. Enter [1] [4] [S] into the UUT. The UUT will now be set to Operating channel 1.
3. Internal software automatically calculates and compensates for the difference between the default standard value and the measured value.
4. The UUT will be considered a failure if the 3 digits indicated on the display are below 050 or above 150.
5. After the 3 digits have been displayed enter [M] to store the data and finish the adjustment.

7 SCHEMATIC DIAGRAMS

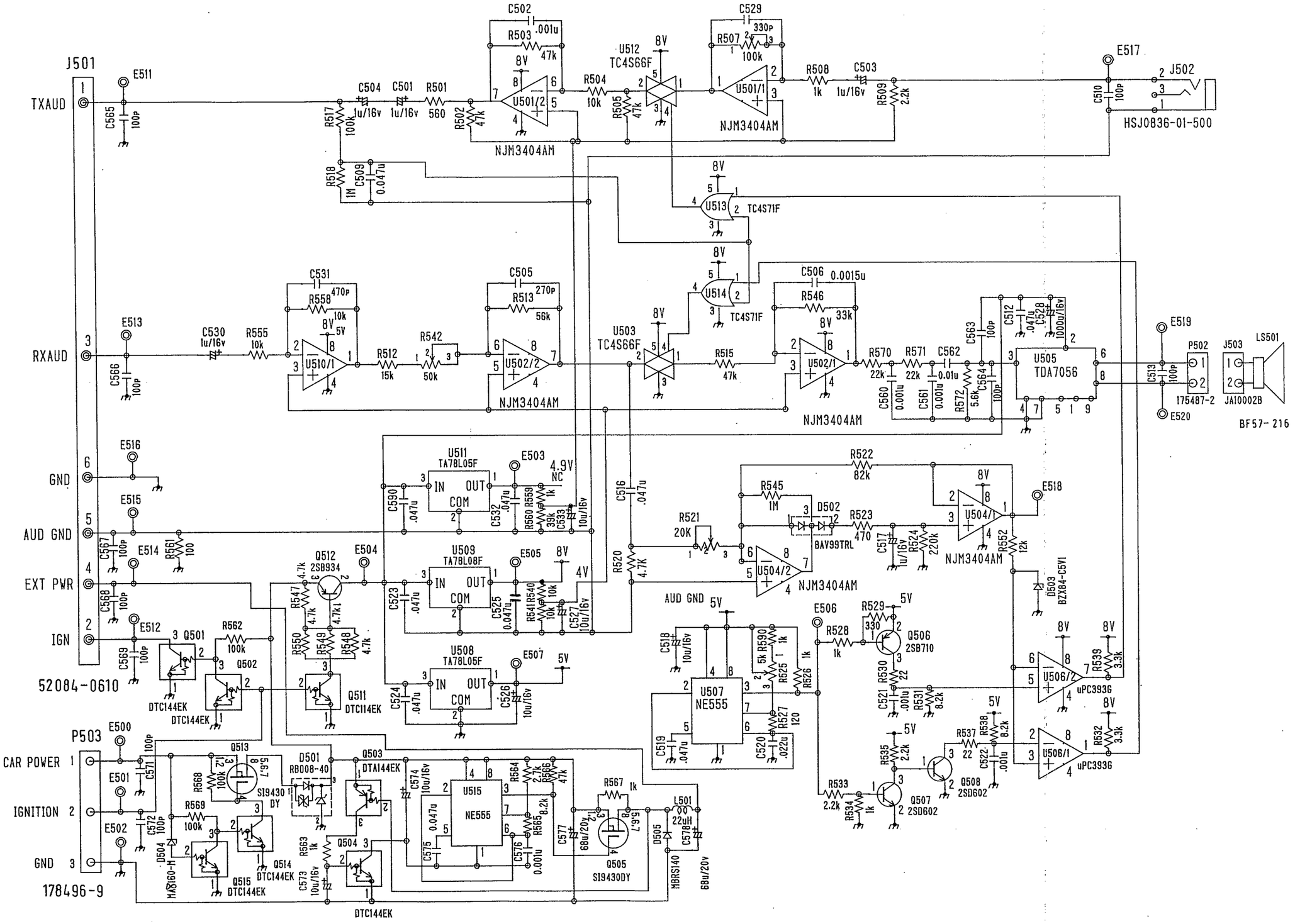
7.1 Control



7.2 RF


FL201 FL10164A
FL202 FL70006A
FL204 FR70001A
FL203 FR70001A
FL301 FL10177A
FL303 FS70002A
FL100 FL10202A
FL104 FL10161A
FL101 FL70016A
U3101 SA516DK
U304 UA70002A
U101 MB15B23
U301 MB1511FPT
U305 UY70003A
E302 EY10059A
E103 EY10055A
P101 PA70001A
EXTPOW ON/OFF
SERIAL(F)
SERIAL(R)
VBAT
BATTID
DISCRI
RSSI
BAT-TEMP
VRX(+3.7V)
GND
RX PSC
AFC CONT
CLK
DATA
STB
RGC
RX LD
TX LD
VF
MOD
VTX(+3.7V)
VAPC
VPA(+7.0V)
PL SEL
CARR ON/OFF
VDET
VG (-1~4V)
RF terminal for H/F
CLK
DATA
STB
VTX
VBATT
PL SEL
CARRIER ON/OFF
VDET
VG
APC

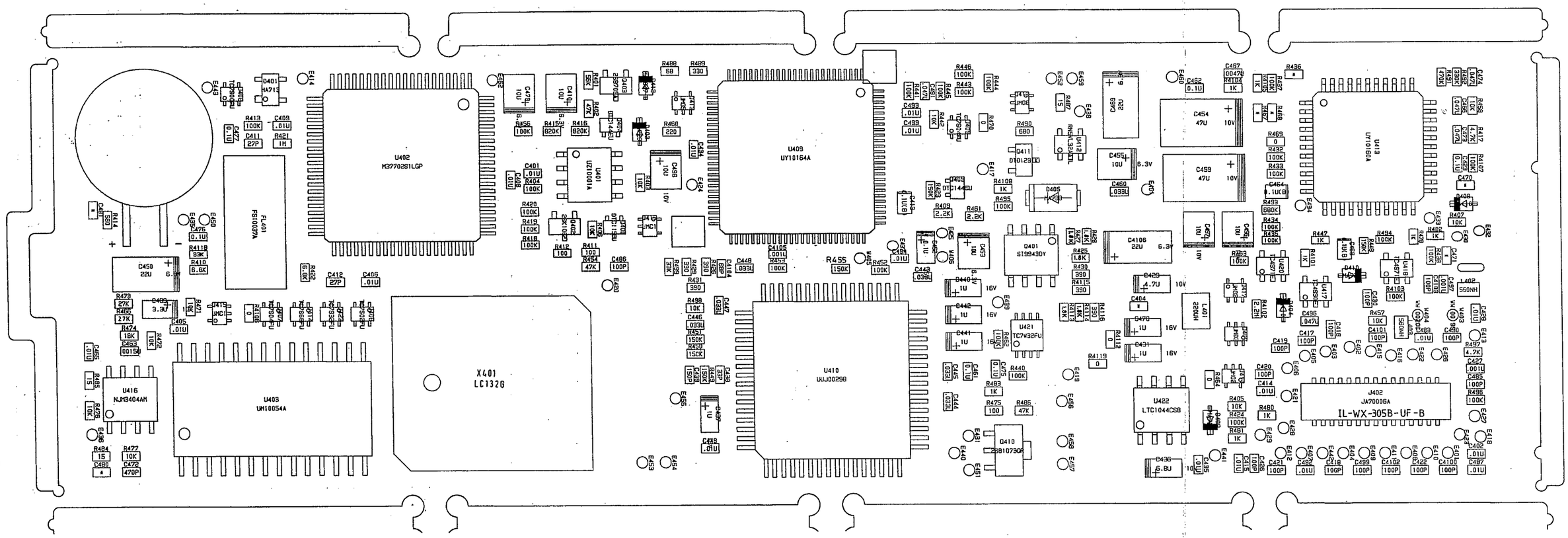
7.3 Handsfree



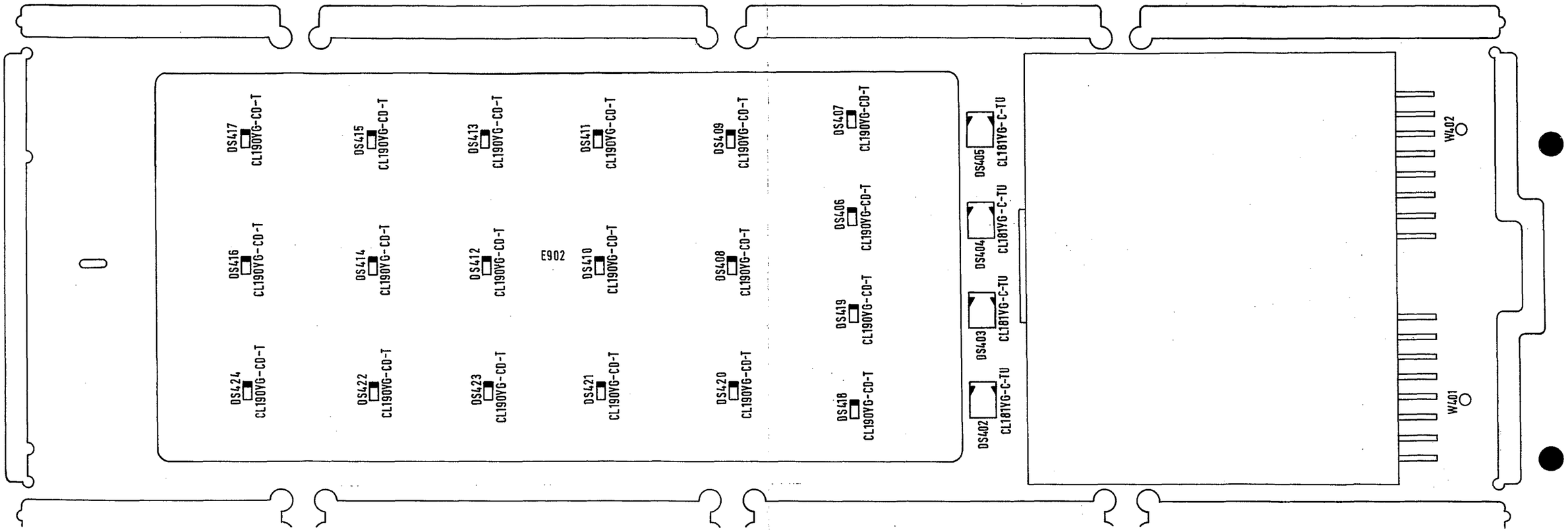
8 LAYOUT DIAGRAMS

8.1 Control

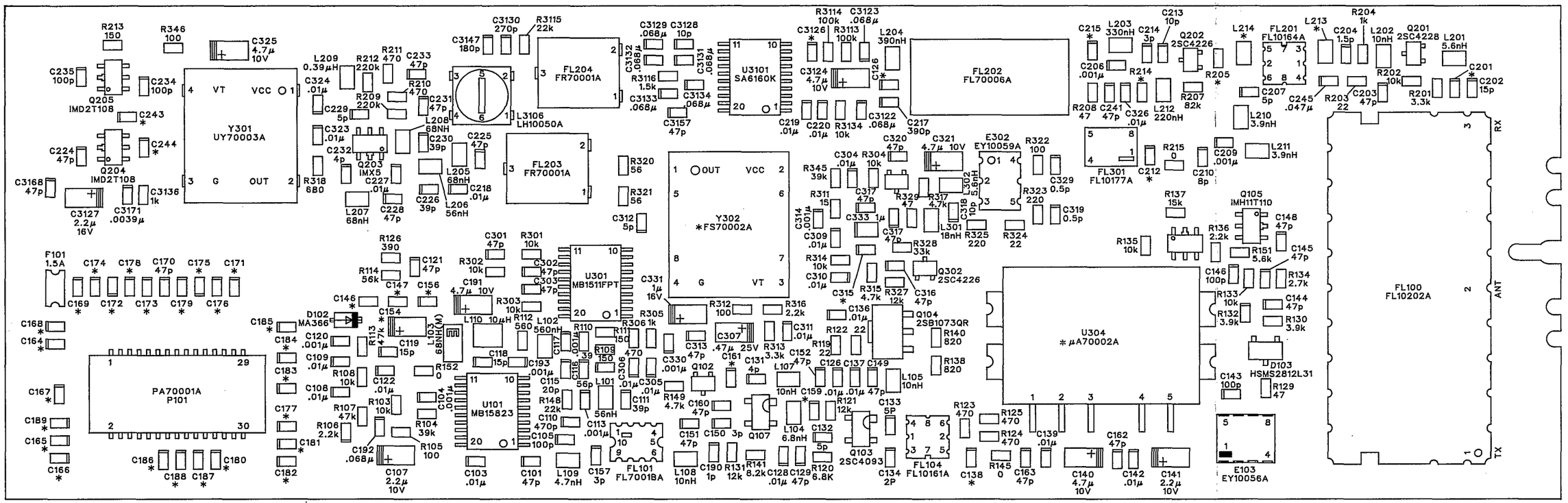
8.1.1 Component side



8.1.2 Solder side

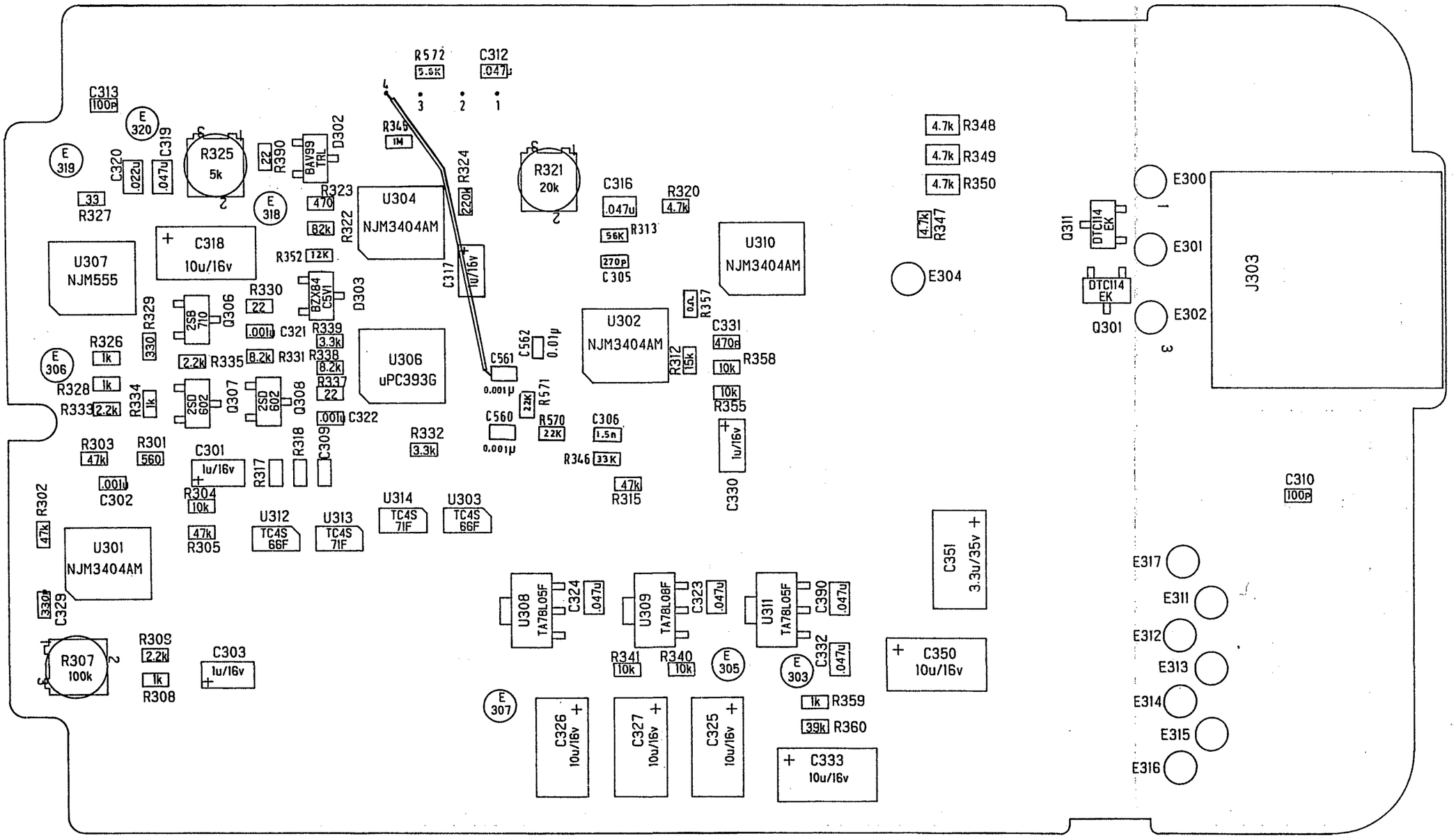


8.2 RF

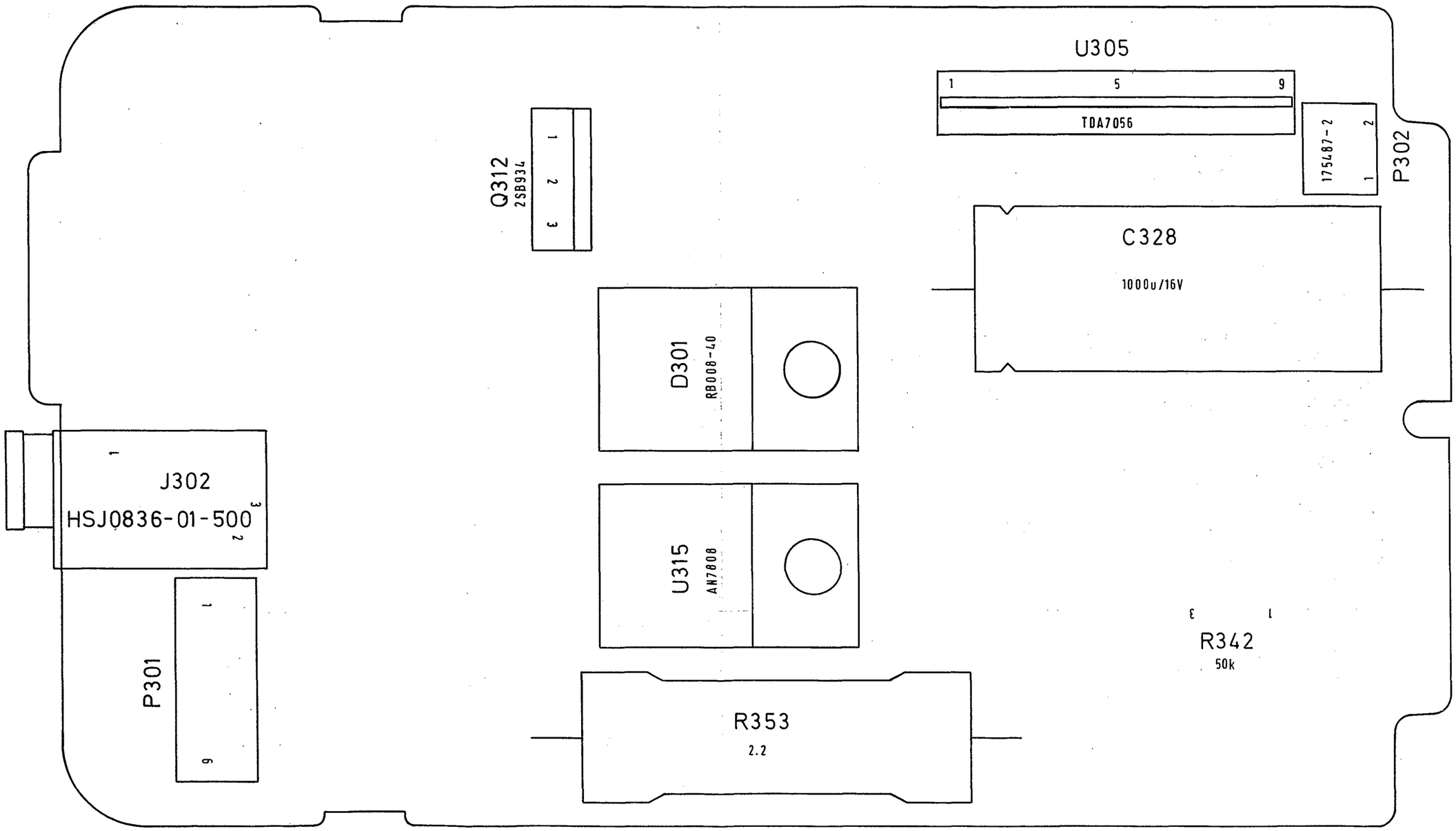

Y301
UY70003A
VT
VCC
G
OUT
Q205
IMD2T108
Q204
IMD2T108
IMX5
Q203
FL204
FR70001A
FL203
FR70001A
L3106
LH10050A
U3101
SA6160K
FL202
FL70006A
Y302
*FS70002A
U301
MB1511FPT
U101
MB15823
PA70001A
P101
D102
MA366
U304
*μA70002A
Q104
2SB1073QR
Q105
IMH11T110
Q103
2SC4093
Q302
2SC4226
Q202
2SC4226
Q201
2SC4228
FL101
FL7001BA
FL104
FL10161A
FL301
FL10177A
E302
EY10059A
FL201
FL10164A
FL100
FL10202A
E103
EY10056A
D103
HSMS2812L31
RX
TX
ANT

8.3 Handsfree

8.3.1 Component side



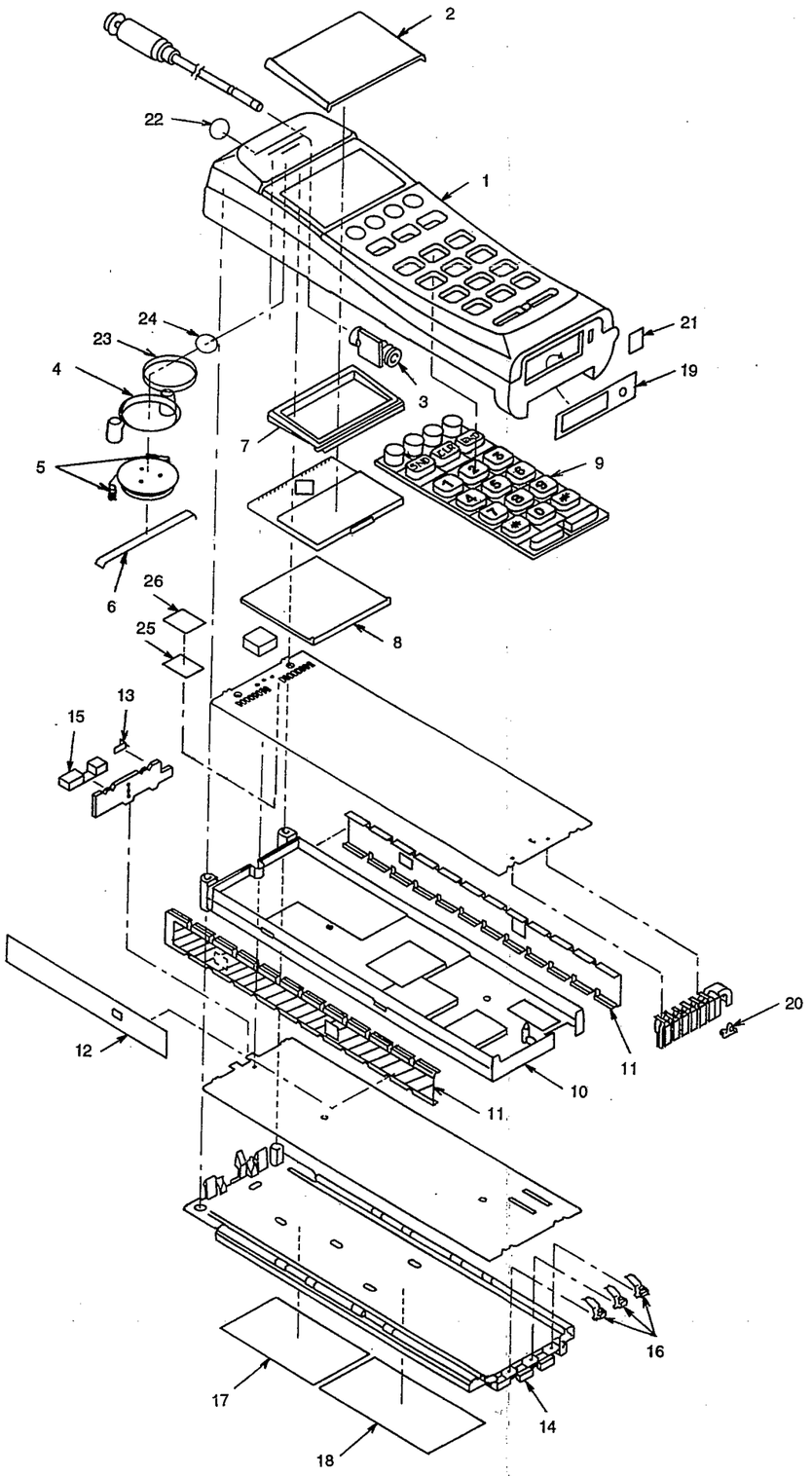
8.3.2 Solder side



9 EXPLODED VIEWS

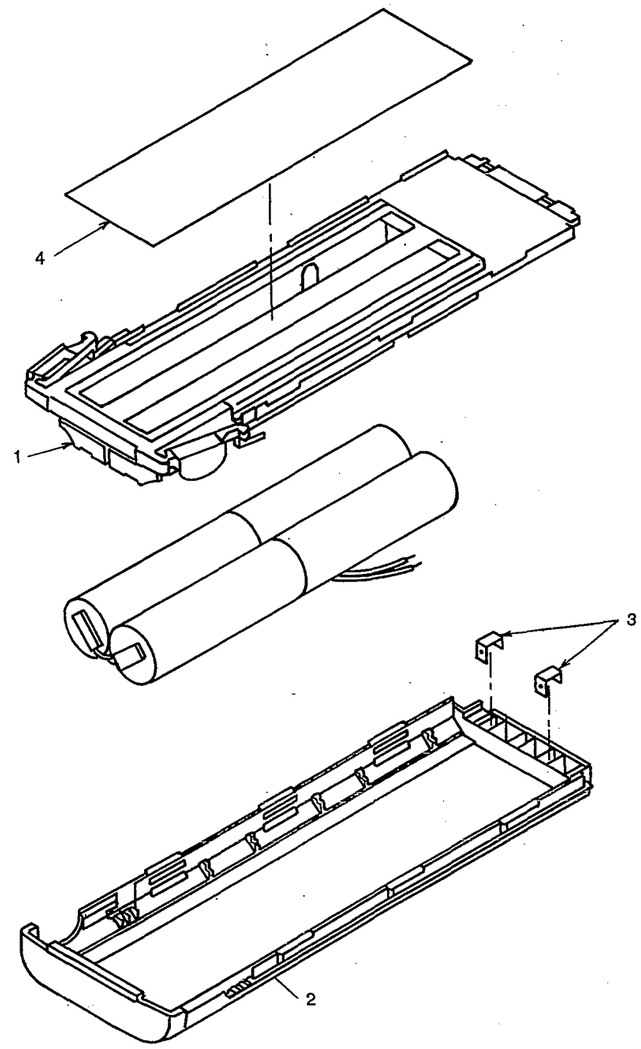
9.1 Telephone

Item No.	Part Symbol	Part Number	Description
1	M101	5N70013A	Cover
2	M102	5C70010A	LED Panel
3	M103	5Z70008A	Ant. Finger Nut
4	M106	5Z70009A	Rec. Tube
5	M107, M108	1B70013A	Rec. Contact
6	M109	1B70008A	Rec. Retainer
7	M110	5U70006A	LCD Cushion
8	M111	5S70007C	LCD Backlight
9	M112	5V70011A	Keyboard
10	M113	4D70001D	Chassis
11	M114, M115	1B70011A	PCB Clip
12	M116	T1-MDS-191A	Antenna Pad
13	M117	1B70010A	Antenna Finger
14	M118	5M70016A	Case
15	M119	1B70012A	Ext. RF Contact
16	M121 - M123	1B70009B	Battery Contact
17	M124	7X70030A	Name Plate
18	M125	7D70030A	Green Label
19	M126	T1-MDS-137	Seal H/F Conn
20	M127	5U70021A	MIC Cushion
21	M128	6V10032A	Net
22	M129	6V10029A	Buzzer Net
23	M130	T1-MDS-136	Receiver Cushion
24	M131	T1-MDS-139	Receiver Net
25	M151	5H10222A	Insulator
26	M152	5U10041A	Cushion



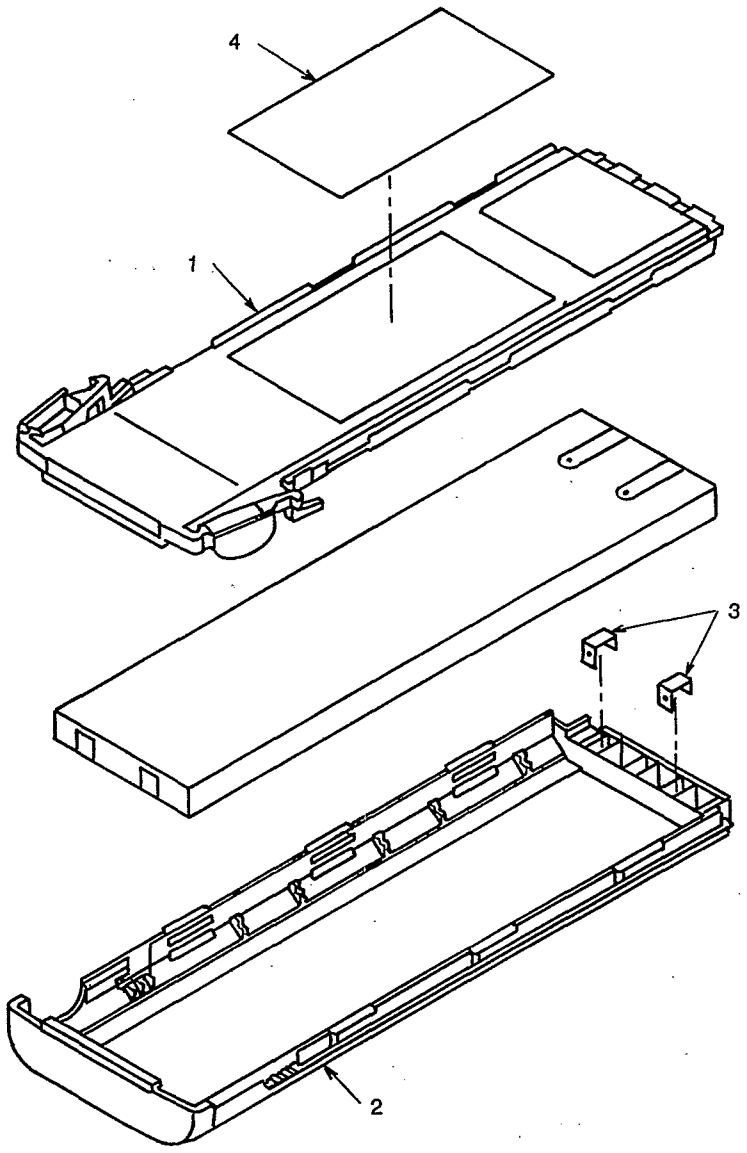
9.2 Battery - 900mAh

Item No.	Part Symbol	Part Number	Description
1	M101	5M70023A	Batt Case - L
2	M102	5N70022A	Batt Cover - L
3	M201, M202	1D70015A	Batt Terminal
4	M203	7X70037A	Name Plate



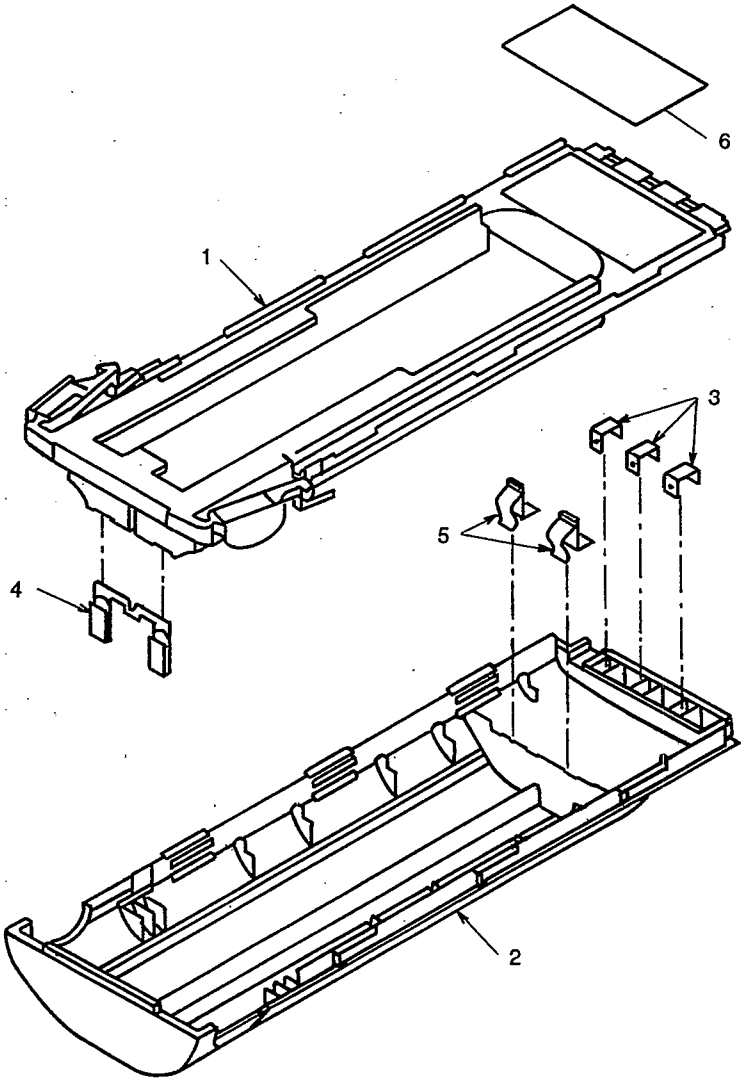
9.3 Battery - 600mAh

Item No.	Part Symbol	Part Number	Description
1	M101	5M70025A	Batt Case - F
2	M102	5N70024A	Batt Cover - F
3	M201, M202	1D70015A	Batt Terminal
4	M203	7X70038A	Name Plate



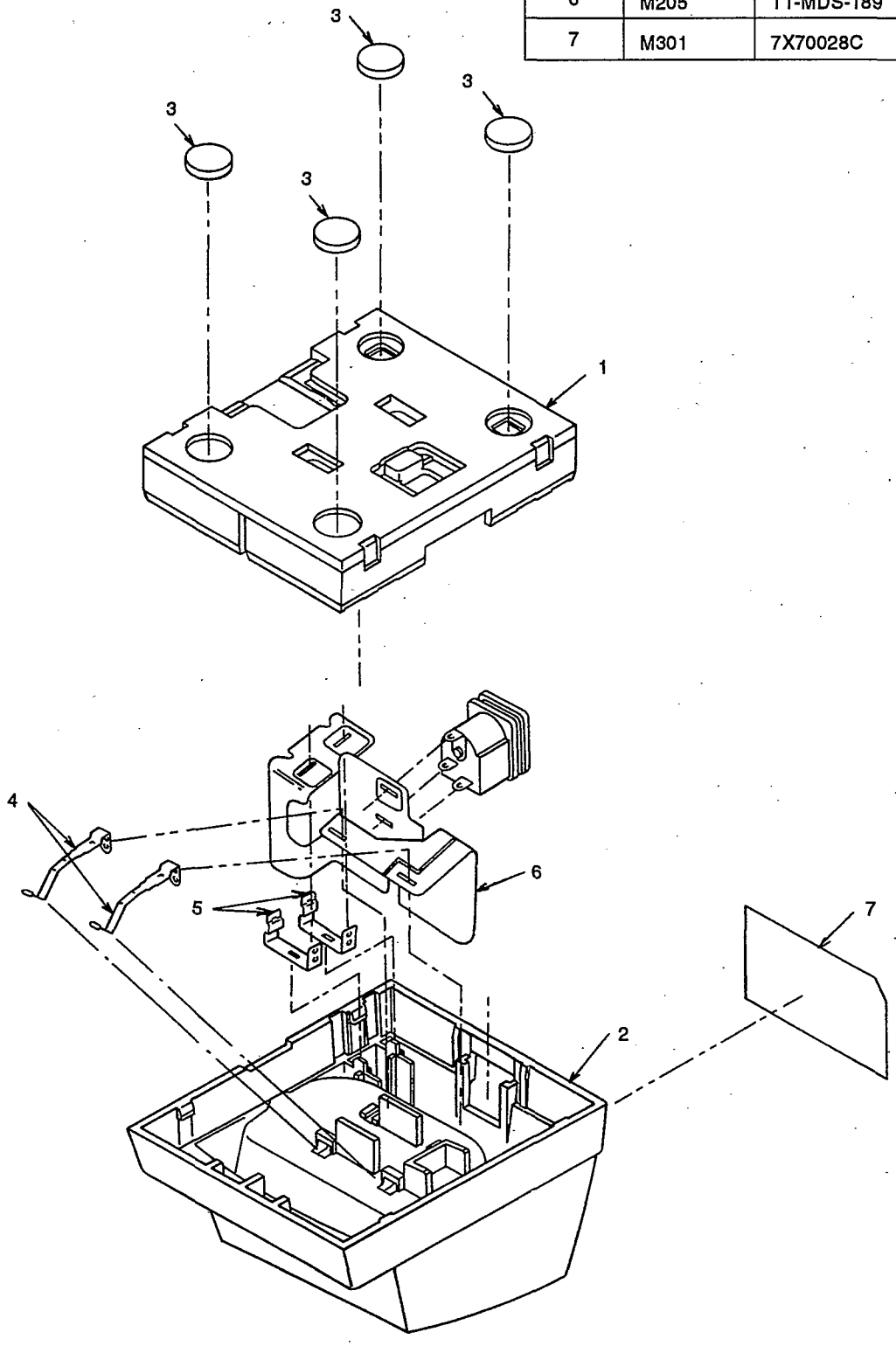
9.4 Dry battery pack

Item No.	Part Symbol	Part Number	Description
1	M101	5M70024A	Batt Case - Dry
2	M102	5N70023A	Batt Cover - Dry
3	M201, M202, M203	1D70015A	Batt Terminal
4	M204	1D70016A	Batt Terminal - Dry Strap
5	M205, M206	1D70017A	Batt Terminal - Dry Ground
6	M207	7X70039A	Name Plate



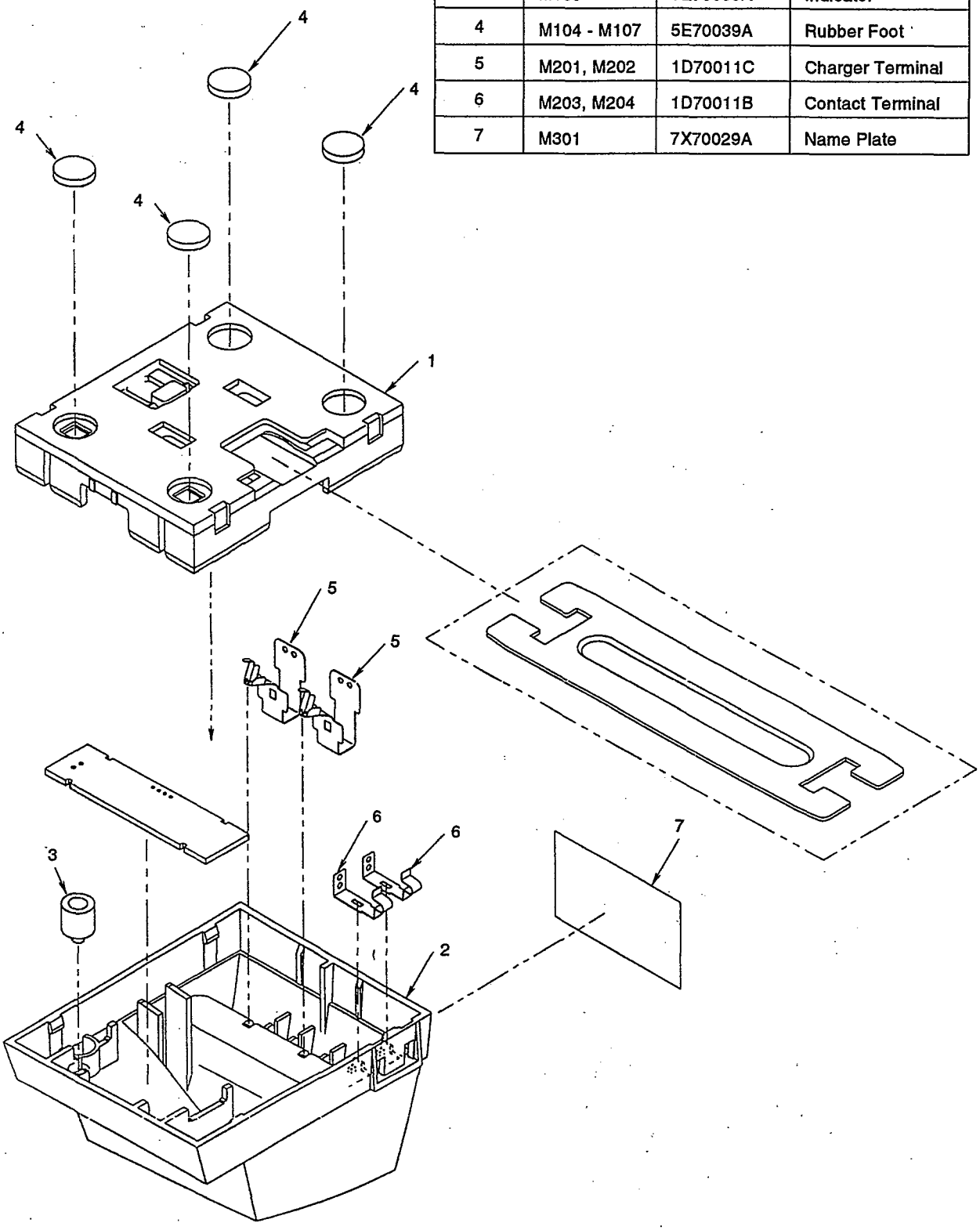
9.5 Rapid charger

Item No.	Part Symbol	Part Number	Description
1	M101	5M70017B	Case
2	M102	5N70014C	Cover
3	M103 - M106	5E70039A	Rubber Foot
4	M201, M202	1D70009B	Charger Terminal
5	M203, M204	1D70010B	Contact Terminal
6	M205	T1-MDS-189	Flexi-PCB1
7	M301	7X70028C	Name Plate

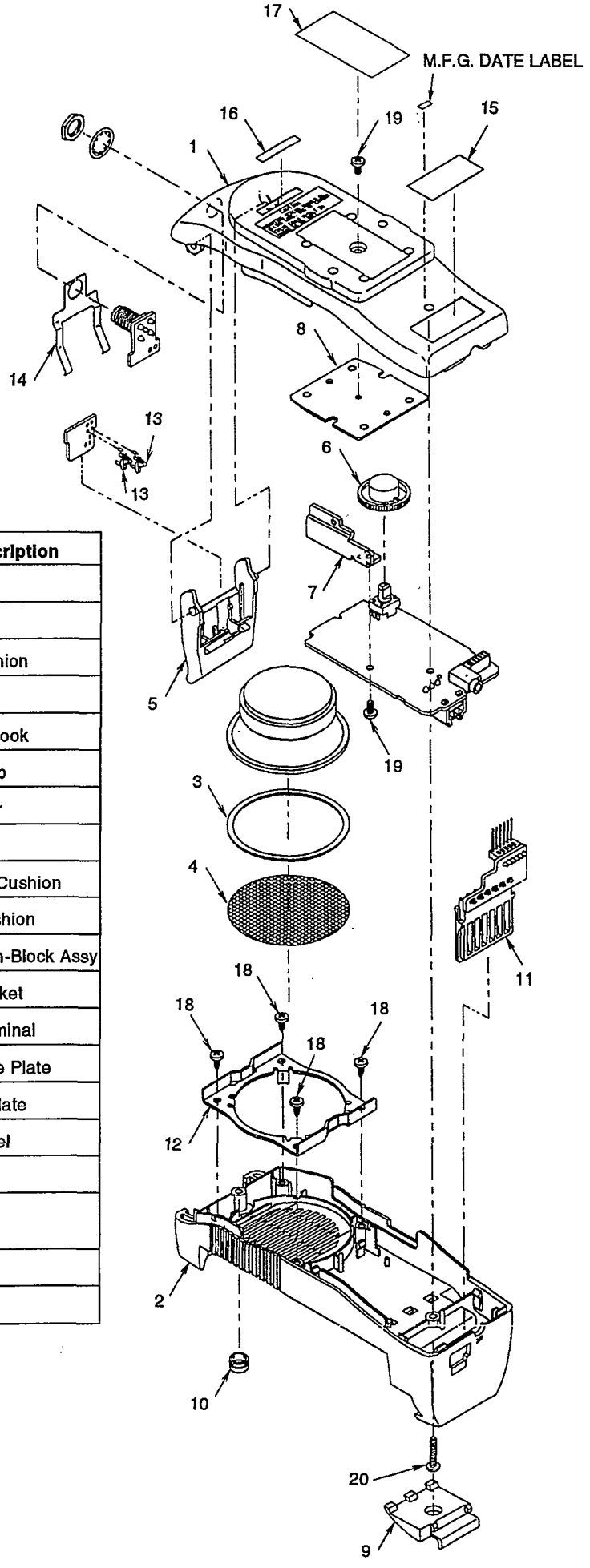


9.6 Trickle charger

Item No.	Part Symbol	Part Number	Description
1	M101	5M70017B	Case
2	M102	5N70015C	Cover
3	M103	5E70009A	Indicator
4	M104 - M107	5E70039A	Rubber Foot
5	M201, M202	1D70011C	Charger Terminal
6	M203, M204	1D70011B	Contact Terminal
7	M301	7X70029A	Name Plate



9.7 Car mount



Item No.	Part Symbol	Part Number	Description
1	M101	5M70019B	Case
2	M102	5N70016B	Cover
3	M103	5B10359A	SP Cushion
4	M104	6V10040A	SP Net
5	M105	5Y70015A	Fixing Hook
6	M106	5R70011A	Vol Knob
7	M107	1EA5094B	Radiator
8	M108	1BC5819A	HF-PLT
9	M109	5U70009C	Bottom Cushion
10	M110	5U70008A	Top Cushion
11	M111	9R70117B	I/O Term-Block Assy
12	M201	1B70016B	SP Bracket
13	M202, M203	1D70013C	Ant Terminal
14	M204	1B70015B	Pressure Plate
15	M301	7X70027A	Name Plate
16	M302	7D70029A	T/A Label
17	M303	7AC5673C	Label
18	M401 - M404	XTB3+8GFX	Screw
19	M405, M406	XSB3+6FX	Screw
20	M407	XSB3+14FX	Screw

10 REPLACEMENT PARTS LIST

10.1 Electronic Parts List

REF	SERVICE NO	DESCRIPTION
BT401	VL12201FC	BACK-UP BATTERY
C101	GRM9C0G470J50	47PF CAPACITOR 1608
C102	GRM9C0G020D50	2PF CAPACITOR 1608
C103	GRM9X7R103K50	10NF CAPACITOR 1608
C104	GRM9X7R102K50	1NF CAPACITOR 1608
C105	GRM9X7R101J50	100PF CAPACITOR 1608
C106	GRM9C0G040C50	4PF CAPACITOR 1608
C107	ECST1AY475ZR	2.2U/10V CAPACITOR
C108	GRM9X7R103K50	10NF CAPACITOR 1608
C109	GRM9X7R103K50	10NF CAPACITOR 1608
C110	GRM9C0G471J50	470PF CAPACITOR 1608
C111	GRM9C0G390J50	39PF CAPACITOR 1608
C1111	GRM9C0G030C50	3PF CAPACITOR 1608
C112	GRM9C0G390J50	39PF CAPACITOR 1608
C113	GRM9X7R102K50	1NF CAPACITOR 1608
C115	GRM9C0G330J50	20PF CAPACITOR 1608
C116	GRM9C0G470J50	56PF CAPACITOR 1608
C117	GRM9X7R102K50	1NF CAPACITOR 1608
C118	GRM9C0G120C50	15PF CAPACITOR 1608
C119	GRM9C0G180J50	15PF CAPACITOR 1608
C120	GRM9X7R102K50	1NF CAPACITOR 1608
C121	GRM9C0G470J50	47PF CAPACITOR 1608
C122	GRM9X7R103K50	10NF CAPACITOR 1608
C126	GRM9X7R103K50	10NF CAPACITOR 1608
C128	GRM9X7R103K50	10NF CAPACITOR 1608
C129	GRM9C0G470J50	47PF CAPACITOR 1608
C131	GRM9C0G040C50	4PF CAPACITOR 1608
C132	GRM9C0G050C50	5PF CAPACITOR 1608
C133	GRM9C0G050C50	5PF CAPACITOR 1608
C134	GRM9CK020C50	2PF CAPACITOR 1608
C136	GRM9X7R103K50	10NF CAPACITOR 1608
C137	GRM9X7R103K50	10NF CAPACITOR 1608
C139	GRM9X7R103K50	10NF CAPACITOR 1608
C140	ECST1AY475ZR	4.7U/10V CAPACITOR
C141	ECST1AY225ZR	2.2U/10V CAPACITOR
C142	GRM9X7R103K50	10NF CAPACITOR 1608
C143	GRM9C0G101J50	100PF CAPACITOR 1608
C144	GRM9C0G470J50	47PF CAPACITOR 1608
C145	GRM9C0G470J50	47PF CAPACITOR 1608
C146	GRM9C0G101J50	100PF CAPACITOR 1608
C148	GRM9C0G470J50	47PF CAPACITOR 1608
C149	GRM9C0G470J50	47PF CAPACITOR 1608
C150	GRM9CJ030C50	3PF CAPACITOR 1608
C151	GRM9C0G470J50	47PF CAPACITOR 1608
C152	GRM9C0G470J50	47PF CAPACITOR 1608
C157	GRM9CJ030C50	3PF CAPACITOR 1608
C160	GRM9C0G470J50	47PF CAPACITOR 1608
C162	GRM9C0G470J50	47PF CAPACITOR 1608
C163	GRM9C0G470J50	47PF CAPACITOR 1608
C170	GRM9C0G470J50	47PF CAPACITOR 1608
C190	GRM9CK010C50	1PF CAPACITOR 1608
C191	ECST1AY475ZR	4.7U/10V CAPACITOR
C192	GRM9Y5V683Z25	68NF CAPACITOR 1608
C202	GRM9C0G150J50	15PF CAPACITOR 1608
C203	GRM9C0G470J50	47PF CAPACITOR 1608
C204	GRM9CK1R5C50	1.5PF CAPACITOR 1608
C206	GRM9X7R102K50	1NF CAPACITOR 1608
C207	GRM9C0G050C50	5PF CAPACITOR 1608
C209	GRM9X7R102K50	1NF CAPACITOR 1608
C210	GRM9C0G080D50	8PF CAPACITOR 1608
C213	GRM9C0G100D50	10PF CAPACITOR 1608
C214	GRM9CJ030C50	3PF CAPACITOR 1608
C217	GRM9C0G391J50	390PF CAPACITOR 1608
C218	GRM9X7R103K50	10NF CAPACITOR 1608

REF	SERVICE NO	DESCRIPTION
C219	GRM9X7R103K50	10NF CAPACITOR 1608
C220	GRM9X7R103K50	10NF CAPACITOR 1608
C224	GRM9C0G470J50	47PF CAPACITOR 1608
C225	GRM9C0G470J50	47PF CAPACITOR 1608
C226	GRM9C0G390J50	39PF CAPACITOR 1608
C227	GRM9X7R103K50	10NF CAPACITOR 1608
C228	GRM9C0G470J50	47PF CAPACITOR 1608
C229	GRM9C0G050C50	5PF CAPACITOR 1608
C230	GRM9C0G390J50	39PF CAPACITOR 1608
C231	GRM9C0G470J50	47PF CAPACITOR 1608
C232	GRM9C0G040C50	4PF CAPACITOR 1608
C233	GRM9C0G470J50	47PF CAPACITOR 1608
C234	GRM9C0G101J50	100PF CAPACITOR 1608
C235	GRM9C0G101J50	100PF CAPACITOR 1608
C241	GRM9C0G470J50	47PF CAPACITOR 1608
C245	GRM9X7R473K16	47NF CAPACITOR 1608
C301	GRM9C0G470J50	47PF CAPACITOR 1608
C302	GRM9C0G470J50	47PF CAPACITOR 1608
C303	GRM9C0G470J50	47PF CAPACITOR 1608
C304	GRM9X7R103K50	10NF CAPACITOR 1608
C305	GRM9X7R103K50	10NF CAPACITOR 1608
C306	GRM9X7R103K50	10NF CAPACITOR 1608
C307	ECST1EY474ZR	0.47U/25V CAPACITOR
C309	GRM9X7R103K50	10NF CAPACITOR 1608
C310	GRM9X7R103K50	10NF CAPACITOR 1608
C311	GRM9X7R103K50	10NF CAPACITOR 1608
C312	GRM9C0G050C50	5PF CAPACITOR 1608
C3122	GRM9Y5V683Z25	68NF CAPACITOR 1608
C3123	GRM9Y5V683Z25	68NF CAPACITOR 1608
C3124	ECST1AY475ZR	4.7U/10V CAPACITOR
C3127	ECST1AY225ZR	2.2U/10V CAPACITOR
C3128	GRM9C0G100D50	10PF CAPACITOR 1608
C3129	GRM9Y5V683Z25	68NF CAPACITOR 1608
C313	GRM9C0G101J50	47PF CAPACITOR 1608
C3130	GRM9C0G271J50	270PF CAPACITOR 1608
C3131	GRM9Y5V683Z25	68NF CAPACITOR 1608
C3132	GRM9Y5V683Z25	68NF CAPACITOR 1608
C3133	GRM9Y5V683Z25	68NF CAPACITOR 1608
C3134	GRM9Y5V683Z25	68NF CAPACITOR 1608
C314	GRM9X7R102K50	1NF CAPACITOR 1608
C3147	GRM9C0G181J50	180PF CAPACITOR 1608
C3157	GRM9C0G470J50	47PF CAPACITOR 1608
C316	GRM9C0G101J50	47PF CAPACITOR 1608
C3168	GRM9C0G470J50	47PF CAPACITOR 1608
C317	GRM9C0G470J50	47PF CAPACITOR 1608
C3171	GRM9X7R392K50	3.9NF CAPACITOR 1608
C318	GRM9C0G100D50	10PF CAPACITOR 1608
C319	GRM9CK0R5C50	0.5PF CAPACITOR 1608
C320	GRM9C0G470J50	47PF CAPACITOR 1608
C321	ECST1AY475ZR	4.7U/10V CAPACITOR
C323	GRM9X7R103K50	10NF CAPACITOR 1608
C324	GRM9X7R103K50	10NF CAPACITOR 1608
C325	ECST1AY475ZR	4.7U/10V CAPACITOR
C326	GRM9X7R103K50	10NF CAPACITOR 1608
C329	GRM9CK0R5C50	0.5PF CAPACITOR 1608
C330	GRM9X7R102K50	1NF CAPACITOR 1608
C331	ECST1CY105ZR	1U/16V CAPACITOR
C333	GRM40F105Z16	CAPACITOR 15P
C401	GRM9X7R103K50	10NF CAPACITOR 1608
C402	GRM9X7R103K50	10NF CAPACITOR 1608
C405	GRM9X7R103K50	10NF CAPACITOR 1608
C406	GRM9X7R103K50	10NF CAPACITOR 1608
C408	GRM9X7R103K50	10NF CAPACITOR 1608
C409	GRM9X7R103K50	10NF CAPACITOR 1608
C410	ECST0JX106ZR	10U/6.3V CAPACITOR
C4100	GRM9C0G101J50	100PF CAPACITOR 1608
C4101	GRM9C0G101J50	100PF CAPACITOR 1608
C4102	GRM9C0G101J50	100PF CAPACITOR 1608
C4103	GRM9C0G101J50	100PF CAPACITOR 1608
C4104	GRM9C0G680J50	68PF CAPACITOR 1608

REF	SERVICE NO	DESCRIPTION
C4105	GRM9X7R102K50	1NF CAPACITOR 1608
C4106	ECST0JC226ZR	22U/6.3V CAPACITOR
C411	GRM9C0G270J50	27PF CAPACITOR 1608
C412	GRM9C0G270J50	27PF CAPACITOR 1608
C413	GRM40R104K16	100 NF CAPACITOR
C414	GRM9X7R103K50	10NF CAPACITOR 1608
C415	GRM9X7R103K50	10NF CAPACITOR 1608
C416	GRM9C0G101J50	100PF CAPACITOR 1608
C417	GRM9C0G101J50	100PF CAPACITOR 1608
C418	GRM9C0G101J50	100PF CAPACITOR 1608
C419	GRM9C0G101J50	100PF CAPACITOR 1608
C420	GRM9C0G101J50	100PF CAPACITOR 1608
C421	GRM9C0G101J50	100PF CAPACITOR 1608
C422	GRM9C0G101J50	100PF CAPACITOR 1608
C423	GRM9Y5V104Z25	100NF CAPACITOR 1608
C426	GRM9C0G101J50	100PF CAPACITOR 1608
C427	GRM9X7R102K50	1NF CAPACITOR 1608
C428	GRM9X7R103K50	10NF CAPACITOR 1608
C429	ECST1AY475ZR	4.7U/10V CAPACITOR
C430	GRM39C0G101J50	100PF CAPACITOR 1608
C431	ECST1CY105ZR	1U/16V CAPACITOR
C433	GRM9X7R103K50	10NF CAPACITOR 1608
C434	GRM9X7R103K50	10NF CAPACITOR 1608
C435	GRM9X7R103K50	10NF CAPACITOR 1608
C436	ECST1AY685ZR	6.8U/10VCAPACITOR
C437	ECST1CY105ZR	1U/16V CAPACITOR
C438	GRM9C0G330J50	33PF CAPACITOR 1608
C439	GRM9C0G151J50	150PF CAPACITOR 1608
C440	ECST1CY105ZR	1U/16V CAPACITOR
C441	ECST1CY105ZR	1U/16V CAPACITOR
C442	ECST1CY105ZR	1U/16V CAPACITOR
C443	GRM39R333K16	33NF CAPACITOR 1608
C444	GRM39R333K16	33NF CAPACITOR 1608
C445	GRM39R333K16	33NF CAPACITOR 1608
C446	GRM39R333K16	33NF CAPACITOR 1608
C447	GRM39R333K16	33NF CAPACITOR 1608
C448	GRM9X7R102K50	33NF CAPACITOR 1608
C449	GRM9X7R103K50	10NF CAPACITOR 1608
C450	ECST0JC226ZR	22U/6.3V CAPACITOR
C451	GRM39CH101J50	100PF CAPACITOR 1608
C452	ECST1VY104ZR	0.1U/35V CAPACITOR
C453	ECST0JX106ZR	10U/6.3V CAPACITOR
C454	ECST1AD476ZR	CAPACITOR
C455	ECST0JX106ZR	10U/6.3V CAPACITOR
C456	ECST1AX106ZR	10U/10V CAPACITOR
C457	ECST1AX106ZR	10U/10V CAPACITOR
C459	ECST1AD476ZR	CAPACITOR
C460	GRM39R333K16	33NF CAPACITOR 1608
C461	GRM9Y5V104Z25	100NF CAPACITOR 1608
C462	GRM40R104K16	100NF CAPACITOR 1608
C463	GRM9X7R152K50	1.5NF CAPACITOR 1608
C464	GRM40R104K16	100 NF CAPACITOR
C465	GRM9X7R103K50	10NF CAPACITOR 1608
C466	GRM9Y5V473Z50	47NF CAPACITOR 1608
C467	GRM9X7R472K50	4.7NF CAPACITOR 1608
C468	GRM40R104K16	100 NF CAPACITOR
C469	ECST0JC226ZR	22U/6.3V CAPACITOR
C472	GRM9C0G471J50	470PF CAPACITOR 1608
C473	GRM9Y5V473Z50	47NF CAPACITOR 1608
C474	GRM9Y5V473Z50	47NF CAPACITOR 1608
C475	GRM40R104K16	100NF CAPACITOR 1608
C476	GRM40R104K16	100NF CAPACITOR 1608
C477	GRM40R104K16	100NF CAPACITOR 1608
C478	ECST1CY105ZR	1U/16V CAPACITOR
C479	ECST0JX106ZR	10U/6.3V CAPACITOR
C485	GRM9C0G101J50	100PF CAPACITOR 1608
C486	GRM9C0G101J50	100PF CAPACITOR 1608
C487	GRM9X7R103K50	10NF CAPACITOR 1608
C488	GRM9X7R103K50	10NF CAPACITOR 1608
C489	ECST1AY335ZR	3.3U/10V CAPACITOR

REF	SERVICE NO	DESCRIPTION
C490	GRM9C0G101J50	100PF CAPACITOR 1608
C491	GRM9Y5V473Z50	47NF CAPACITOR 1608
C492	GRM9X7R103K50	10NF CAPACITOR 1608
C493	GRM9X7R103K50	10NF CAPACITOR 1608
C494	GRM9X7R103K50	10NF CAPACITOR 1608
C496	GRM9Y5V473Z50	47NF CAPACITOR 1608
C497	GRM9X7R102K50	1NF CAPACITOR 1608
C498	ECST1AX106ZR	10U/10V CAPACITOR
C499	GRM9C0G101J50	100PF CAPACITOR 1608
C501	ECST1CY105ZR	1U/16V CAPACITOR
C502	GRM9X7R102K50	1NF CAPACITOR 1608
C503	ECST1CY105ZR	1U/16V CAPACITOR
C512	GRM40B473K25	47NF CAPACITOR
C513	GRM9X7R101K50	100PF CAPACITOR 1608
C516	GRM40B473K25	47NF CAPACITOR
C517	ECST1CY105ZR	1U/16V CAPACITOR
C518	ECST1CC106ZR	10U/16V CAPACITOR
C519	GRM40B473K25	47NF CAPACITOR
C520	GRM40B223J50	22NF CAPACITOR
C521	GRM9X7R102K50	1NF CAPACITOR 1608
C522	GRM9X7R102K50	1NF CAPACITOR 1608
C523	GRM40B473K25	47NF CAPACITOR
C524	GRM40B473K25	47NF CAPACITOR
C525	ECST1CC106ZR	47NF CAPACITOR
C526	ECST1CC106ZR	10U/16V CAPACITOR
C527	ECST1CC106ZR	10U/16V CAPACITOR
C528	ECEB10U102A	CAPACITOR
C529	GRM9X7R331K50	330PF CAPACITOR 1608
C530	ECST1CY105ZR	1U/16V CAPACITOR
C531	GRM9X7R471K50	470PF CAPACITOR 1608
C532	GRM40B473K25	47NF CAPACITOR
C533	ECST1CC106ZR	10U/16V CAPACITOR
C550	ECST1CC106ZR	10U/16V CAPACITOR
C551	ECST1VC335ZR	3.3U/35V CAPACITOR
C560	GRM9X7R102K50	1NF CAPACITOR 1608
C561	GRM9X7R102K50	1NF CAPACITOR 1608
C562	GRM9X7R103K50	10NF CAPACITOR 1608
C563	GRM9X7R101K50	100PF CAPACITOR 1608
C564	GRM9X7R101K50	100PF CAPACITOR 1608
C565	GRM9X7R101K50	100PF CAPACITOR 1608
C566	GRM9X7R101K50	100PF CAPACITOR 1608
C567	GRM9X7R101K50	100PF CAPACITOR 1608
C568	GRM9X7R101K50	100PF CAPACITOR 1608
C569	GRM9X7R101K50	100PF CAPACITOR 1608
C571	GRM9X7R101K50	100PF CAPACITOR 1608
C572	GRM9X7R101K50	100PF CAPACITOR 1608
C573	ECST1CC106ZR	10U/16V CAPACITOR
C574	ECST1CC106ZR	10U/16V CAPACITOR
C575	GRM4X7R473K25	47NF CAPACITOR
C576	GRM9X7R102K50	1NF CAPACITOR 1608
C590	GRM40B473K25	47NF CAPACITOR
D1	MA3051LTX	DIODE
D102	MA366TX	DIODE
D103	HSMS2812L31	DIODE
D2	TLR123	LED
D3	MA112TX	DIODE
D401	MA713TX	DIODE
D402	MA729TX	DIODE
D404	MA110TX	DIODE
D405	MA738TX	DIODE
D408	MA110TX	DIODE
D409	MA729TX	DIODE
D410	MA729TX	DIODE
D412	MA8047LTX	DIODE
D501	RB00840T	DIODE
D502	BAV99TR	DIODE
D504	MA5160TX	DIODE
D505	BZX84C8V2TRL	DIODE
DS401	LPH38991	LCD (COG TYPE)
DS402	CL181YGCTS	LED

REF	SERVICE NO	DESCRIPTION
DS403	CL181YGCTS	LED
DS404	CL181YGCTS	LED
DS405	CL181YGCTS	LED
DS406	CL190YGCDT	LED
DS407	CL190YGCDT	LED
DS408	CL190YGCDT	LED
DS409	CL190YGCDT	LED
DS410	CL190YGCDT	LED
DS411	CL190YGCDT	LED
DS412	CL190YGCDT	LED
DS413	CL190YGCDT	LED
DS414	CL190YGCDT	LED
DS415	CL190YGCDT	LED
DS416	CL190YGCDT	LED
DS417	CL190YGCDT	LED
DS418	CL190YGCDT	LED
DS419	CL190YGCDT	LED
DS420	CL190YGCDT	LED
DS421	CL190YGCDT	LED
DS422	CL190YGCDT	LED
DS423	CL190YGCDT	LED
DS424	CL190YGCDT	LED
E103	EY10056A	COUPLER 800-1000 MHZ
E302	EY10059A	COUPLER 1024.5 MHZ
F101	CP32161500	FUSE
FL100	FL10202A	DUPLEXER
FL101	FL70016A	FILTER
FL104	FL10161A	SAW FILTER 888.5 MHZ
FL201	FL10164A	SAW FILTER 933.5 MHZ
FL202	FL70006A	FILTER
FL203	FR70001A	CERAMIC FILTER 462.5 KHZ
FL204	FR70001A	CERAMIC FILTER 462.5 KHZ
FL301	FL10177A	LC FILTER 1024.5 MHZ
FL303	FS70002A	LOCAL VCO (1007-1041 MHZ)
J	VMU3351	UHF CONNECTOR
J402	JA70006A	B TO B CONNECTOR
J502	HSJ083601500	MICROPHONE JACK
J503	JA10002B	SPEAKER CABLE
L101	LL2012F56NK	56NH INDUCTOR
L102	MLF2012DR56KT	560NH INDUCTOR
L103	ELJNC56NJF	68NH INDUCTOR
L104	LL2012F6N8K	6.8NH INDUCTOR
L105	LL2012F10NK	10NH INDUCTOR
L107	LL2012F10NK	10NH INDUCTOR
L108	LL2012F10NK	10NH INDUCTOR
L109	LL2012F4N7K	4.7NH INDUCTOR
L110	ELJFC100KF	INDUCTOR
L111	LL2012F5N6K	5.6NH INDUCTOR
L112	LL2012F4N7K	4.7NH INDUCTOR
L113	LL2012F10NK	10NH INDUCTOR
L201	LL2012F5N6K	5.6NH INDUCTOR
L202	LL2012F10NK	10NH INDUCTOR
L203	MLF2012DR33KT	330NH INDUCTOR
L204	MLF2012DR39KT	390NH INDUCTOR
L205	LL2012F68NK	68NH INDUCTOR
L206	LL2012F56NK	56NH INDUCTOR
L207	LL2012F68NK	68NH INDUCTOR
L208	LL2012F68NK	68NH INDUCTOR
L209	MLF2012DR39KT	390NH INDUCTOR
L210	LL2012F3N9K	3.9NH INDUCTOR
L211	LL2012F3N9K	3.9NH INDUCTOR
L212	MLF2012DR22KT	220NH INDUCTOR
L301	LL2012F15NK	18NH INDUCTOR
L302	LL2012F4N7K	5.6NH INDUCTOR
L3106	LH10050A	INDUCTOR
L401	ELJPA221KF	INDUCTOR
L402	MLF2012DR56KT	560NH INDUCTOR
L403	MLF2012DR56KT	560NH INDUCTOR
L501	CDR74220NC	INDUCTOR
LS401	F2002	RECEIVER

REF	SERVICE NO	DESCRIPTION
LS402	3H9350	BUZZER
LS501	BP57S103	SPEAKER
MK101	HM10002A	MICROPHONE
MK401	WM62AT102	MICROPHONE
MPK15	MIC01177KC0M	MICROPHONE
P	530950610	MOLEX 6-PIN I/O CONNECTOR
P1	T1MDS052	BLISTER PACK
P101	PA70001A	B TO B CONNECTOR
P2	T1MDS053	BLISTER CARD
P401	PY70006A	CONNECTOR
P502	1754872	SPEAKER CONNECTOR
P503	1784969	CONNECTOR
Q1	2SD1328STTX	TRANSISTOR
Q102	DTC124TUT106	TRANSISTOR
Q103	2SC4093T1B	TRANSISTOR
Q104	2SB1073QRTX	TRANSISTOR
Q105	IMH11T110	TRANSISTOR
Q106	IMZ1T108	TRANSISTOR
Q107	2SC5080ZDTL	TRANSISTOR
Q201	2SC4228T1B	TRANSISTOR
Q202	2SC4226T1B	TRANSISTOR
Q203	IMX5T110	TRANSISTOR
Q204	IMD2T108	TRANSISTOR
Q205	IMD2T108	TRANSISTOR
Q301	2SD1823TTX	TRANSISTOR
Q302	2SC4226T1B	TRANSISTOR
Q401	SI9943DY	TRANSISTOR
Q402	2SK1062TE85L	TRANSISTOR
Q403	2SB709ATX	TRANSISTOR
Q404	DTC144EUT106	TRANSISTOR
Q405	DTC144EUT106	TRANSISTOR
Q406	DTC144EUT106	TRANSISTOR
Q409	UMD3TR	TRANSISTOR
Q410	2SB766ATX	TRANSISTOR
Q411	DTD123TKT96	TRANSISTOR
Q412	UMG8TR	TRANSISTOR
Q413	UMG5TR	TRANSISTOR
Q414	UMG2TR	TRANSISTOR
Q415	UMC1TR	TRANSISTOR
Q416	UMC1TR	TRANSISTOR
Q417	UMG2TR	TRANSISTOR
Q501	DTC114EKT96	TRANSISTOR
Q502	DTC144EKT146	TRANSISTOR
Q503	DTA144EKT146	TRANSISTOR
Q504	DTC144EKT146	TRANSISTOR
Q506	2SB710RSTX	TRANSISTOR
Q507	2SD602RSTX	USE - 2SD602RSTX
Q508	2SD602RSTX	USE - 2SD602RSTX
Q511	DTC114EKT96	TRANSISTOR
Q512	2SB934	TRANSISTOR
Q514	DTC144EKT146	TRANSISTOR
Q515	DTC144EKT146	TRANSISTOR
R1	ERDS1TJ102B	LEADED RESISTOR 1K
R1	ERJ3GEYJ470V	47R RESISTOR 1608
R103	ERJ3GEYJ103V	10K RESISTOR 1608
R104	ERJ3GEYJ393V	39K RESISTOR 1608
R105	ERJ3GEYJ101V	100R RESISTOR 1608
R106	ERJ3GEYJ102V	2.2K RESISTOR 1608
R107	ERJ3GEYJ122V	47K RESISTOR 1608
R108	ERJ3GEYJ822V	10K RESISTOR 1608
R109	ERJ3GEYJ151V	150R RESISTOR 1608
R110	ERJ3GEYJ390V	39R RESISTOR 1608
R111	ERJ3GEYJ151V	150R RESISTOR 1608
R112	ERJ3GEYJ561V	560R RESISTOR 1608
R113	ERJ3GEYJ472V	4.7K RESISTOR 1608
R114	ERJ3GEYJ563V	56K RESISTOR 1608
R119	ERJ3GEYJ220V	22R RESISTOR 1608
R120	ERJ3GEYJ682V	6.8K RESISTOR 1608
R121	ERJ3GEYJ123V	12K RESISTOR 1608
R122	ERJ3GEYJ220V	22R RESISTOR 1608

REF	SERVICE NO	DESCRIPTION
R123	ERJ3GEYJ471V	470R RESISTOR 1608
R124	ERJ3GEYJ120V	12R RESISTOR 1608
R125	ERJ3GEYJ471V	470R RESISTOR 1608
R126	ERJ3GEYJ821V	390R RESISTOR 1608
R129	ERJ3GEYJ470V	47R RESISTOR 1608
R130	ERJ3GEYJ392V	3.9K RESISTOR 1608
R131	ERJ3GEYJ123V	12K RESISTOR 1608
R132	ERJ3GEYJ392V	3.9K RESISTOR 1608
R133	ERJ3GEYJ103V	10K RESISTOR 1608
R134	ERJ3GEYJ272V	2.7K RESISTOR 1608
R135	ERJ3GEYJ103V	10K RESISTOR 1608
R136	ERJ3GEYJ222V	2.2K RESISTOR 1608
R137	ERJ3GEYJ153V	15K RESISTOR 1608
R138	ERJ3GEYJ821V	820R RESISTOR 1608
R140	ERJ3GEYJ821V	820R RESISTOR 1608
R141	ERJ3GEYJ822V	8.2K RESISTOR 1608
R145	ERJ3GEY0R00V	0R RESISTOR 1608
R148	ERJ3GEYJ153V	22K RESISTOR 1608
R149	ERJ3GEYJ472V	4.7K RESISTOR 1608
R150	ERJ3GEYJ273V	0R RESISTOR 1608
R151	ERJ3GEYJ562V	5.6K RESISTOR 1608
R152	ERJ3GEY0R00V	0R RESISTOR 1608
R2	ERJ3GEYJ101V	100R RESISTOR 1608
R201	ERJ3GEYJ332V	3.3K RESISTOR 1608
R202	ERJ3GEYJ103V	10K RESISTOR 1608
R203	ERJ3GEYJ220V	22R RESISTOR 1608
R204	ERJ3GEYJ102V	1K RESISTOR 1608
R207	ERJ3GEYJ823V	82K RESISTOR 1608
R208	ERJ3GEYJ470V	47R RESISTOR 1608
R209	ERJ3GEYJ224V	220K RESISTOR 1608
R210	ERJ3GEYJ471V	470R RESISTOR 1608
R211	ERJ3GEYJ471V	470R RESISTOR 1608
R212	ERJ3GEYJ224V	220K RESISTOR 1608
R213	ERJ3GEYJ151V	150R RESISTOR 1608
R215	ERJ3GEY0R00V	0R RESISTOR 1608
R3	ERJ3GEYJ102V	1K RESISTOR 1608
R301	ERJ3GEYJ103V	10K RESISTOR 1608
R302	ERJ3GEYJ103V	10K RESISTOR 1608
R303	ERJ3GEYJ103V	10K RESISTOR 1608
R304	ERJ3GEYJ103V	10K RESISTOR 1608
R305	ERJ3GEYJ102V	1K RESISTOR 1608
R306	ERJ3GEYJ471V	470R RESISTOR 1608
R311	ERJ3GEYJ150V	15R RESISTOR 1608
R3113	ERJ3GEYJ104V	100K RESISTOR 1608
R3114	ERJ3GEYJ104V	100K RESISTOR 1608
R3115	ERJ3GEYJ223V	22K RESISTOR 1608
R3116	ERJ3GEYJ152V	1.5K RESISTOR 1608
R312	ERJ3GEYJ101V	100R RESISTOR 1608
R313	ERJ3GEYJ272V	3.3K RESISTOR 1608
R3134	ERJ3GEYJ103V	10K RESISTOR 1608
R3136	ERJ3GEYJ102V	1K RESISTOR 1608
R314	ERJ3GEYJ103V	10K RESISTOR 1608
R315	ERJ3GEYJ472V	4.7K RESISTOR 1608
R316	ERJ3GEYJ222V	2.2K RESISTOR 1608
R317	ERJ3GEYJ472V	4.7K RESISTOR 1608
R318	ERJ3GEYJ681V	680R RESISTOR 1608
R319	ERJ3GEYJ150V	0R RESISTOR 1608
R320	ERJ3GEYJ150V	56R RESISTOR 1608
R321	ERJ3GEYJ150V	56R RESISTOR 1608
R322	ERJ3GEYJ101V	100R RESISTOR 1608
R323	ERJ3GEYJ221V	220R RESISTOR 1608
R324	ERJ3GEYJ220V	22R RESISTOR 1608
R325	ERJ3GEYJ221V	220R RESISTOR 1608
R327	ERJ3GEYJ123V	12K RESISTOR 1608
R328	ERJ3GEYJ333V	33K RESISTOR 1608
R329	ERJ3GEYJ470V	47R RESISTOR 1608
R345	ERJ3GEYJ393V	39K RESISTOR 1608
R346	ERJ3GEYJ101V	100R RESISTOR 1608
R4	ERJ3GEYJ102V	1K RESISTOR 1608
R401	ERJ3GEYJ563V	56K RESISTOR 1608

REF	SERVICE NO	DESCRIPTION
R402	ERJ3GEYJ473V	47K RESISTOR 1608
R403	ERJ3GEYJ103V	10K RESISTOR 1608
R404	ERJ3GEYJ104V	100K RESISTOR 1608
R405	ERJ3GEYJ103V	10K RESISTOR 1608
R406	ERJ3GEYJ103V	10K RESISTOR 1608
R407	ERJ3GEYJ104V	10K RESISTOR 1608
R408	ERJ3GEYJ222V	2.2K RESISTOR 1608
R408	ERJ3GEYJ222V	22K RESISTOR
R409	ERJ3GEYJ222V	2.2K RESISTOR 1608
R410	ERJ3GEYJ561V	6.8K RESISTOR 1608
R4101	ERJ3GEYJ102V	1K RESISTOR 1608
R4102	ERJ3GEYK225V	2.2M RESISTOR 1608
R4103	ERJ3GEYJ104V	100K RESISTOR 1608
R4104	ERJ3GEYJ102V	1K RESISTOR 1608
R4105	ERJ3GEYJ102V	1K RESISTOR 1608
R4106	ERJ3GEY0R00V	0R RESISTOR 1608
R4107	ERJ3GEYJ104V	100K RESISTOR 1608
R4108	ERJ3GEYJ102V	1K RESISTOR 1608
R411	ERJ3GEYJ101V	100R RESISTOR 1608
R4112	ERJ3GEYJ470V	0R RESISTOR 1608
R4113	ERJ3GEY0R00V	1.8K RESISTOR 1608
R4114	ERJ3GEY0R00V	1.8K RESISTOR 1608
R4115	ERJ3GEY0R00V	390R RESISTOR 1608
R4116	ERJ3GEY0R00V	390R RESISTOR 1608
R4118	ERJ3GEYJ333V	33K RESISTOR 1608
R4119	ERJ3GEY0R00V	0R RESISTOR 1608
R412	ERJ3GEYJ101V	100R RESISTOR 1608
R413	ERJ3GEYJ104V	100K RESISTOR 1608
R414	ERJ3GEYJ561V	560R RESISTOR 1608
R415	ERJ3GEYJ824V	820K RESISTOR 1608
R4151	ERJ3GEYJ101V	100R RESISTOR 1608
R4152	ERJ3GEYJ101V	100R RESISTOR 1608
R416	ERJ3GEYJ824V	820K RESISTOR 1608
R417	ERJ3GEYJ472V	4.7K RESISTOR 1608
R418	ERJ3GEYJ104V	100K RESISTOR 1608
R419	ERJ3GEYJ104V	100K RESISTOR 1608
R420	ERJ3GEYJ104V	100K RESISTOR 1608
R421	ERJ3GEYJ105V	1M RESISTOR 1608
R422	ERJ3GEYJ682V	6.8K RESISTOR 1608
R423	ERJ3GEYJ154V	150K RESISTOR 1608
R424	ERJ3GEYJ104V	100K RESISTOR 1608
R425	ERJ3GEYJ101V	1.8K RESISTOR 1608
R426	ERJ3GEYJ101V	390R RESISTOR 1608
R427	ERJ3GEYJ101V	1.8K RESISTOR 1608
R428	ERJ3GEYJ101V	1.8K RESISTOR 1608
R429	ERJ3GEYJ101V	390R RESISTOR 1608
R430	ERJ3GEYJ101V	390R RESISTOR 1608
R431	ERJ3GEYJ101V	390R RESISTOR 1608
R432	ERJ3GEYJ104V	100K RESISTOR 1608
R433	ERJ3GEYJ104V	100K RESISTOR 1608
R434	ERJ3GEYJ104V	100K RESISTOR 1608
R435	ERJ3GEYJ104V	100K RESISTOR 1608
R437	ERJ3GEYJ104V	100K RESISTOR 1608
R438	ERJ3GEYJ104V	100K RESISTOR 1608
R439	ERJ3GEYJ473V	47K RESISTOR 1608
R440	ERJ3GEYJ103V	4.7K RESISTOR 1608
R441	ERJ3GEYJ104V	100K RESISTOR 1608
R442	ERJ3GEYJ103V	10K RESISTOR 1608
R443	ERJ3GEYJ104V	100K RESISTOR 1608
R444	ERJ3GEYJ104V	100K RESISTOR 1608
R445	ERJ3GEYJ104V	100K RESISTOR 1608
R446	ERJ3GEYJ104V	100K RESISTOR 1608
R447	ERJ3GEYJ102V	1K RESISTOR 1608
R448	ERJ3GEYJ154V	150K RESISTOR 1608
R449	ERJ3GEYJ154V	150K RESISTOR 1608
R450	ERJ3GEYJ154V	150K RESISTOR 1608
R451	ERJ3GEYJ154V	150K RESISTOR 1608
R452	ERJ3GEYJ104V	100K RESISTOR 1608
R453	ERJ3GEYJ104V	100K RESISTOR 1608
R454	ERJ3GEYJ473V	47K RESISTOR 1608

REF	SERVICE NO	DESCRIPTION
R455	ERJ3GEYJ154V	150K RESISTOR 1608
R456	ERJ3GEYJ104V	100K RESISTOR 1608
R457	ERJ3GEYJ103V	10K RESISTOR 1608
R458	ERJ3GEYJ103V	10K RESISTOR 1608
R460	ERJ3GEYJ221V	220R RESISTOR 1608
R461	ERJ3GEYJ222V	2.2K RESISTOR 1608
R462	ERJ3GEYJ104V	100K RESISTOR 1608
R463	ERJ3GEYJ104V	100K RESISTOR 1608
R464	ERJ3GEY0R00V	0R RESISTOR 1608
R466	ERJ3GEYJ183V	22K RESISTOR 1608
R466	ERJ3GEYJ183V	27K RESISTOR 1608
R469	ERJ3GEY0R00V	0R RESISTOR 1608
R470	ERJ3GEY0R00V	0R RESISTOR 1608
R471	ERJ3GEYJ103V	10K RESISTOR 1608
R472	ERJ3GEYJ103V	10K RESISTOR 1608
R473	ERJ3GEYJ273V	27K RESISTOR 1608
R474	ERJ3GEYJ183V	18K RESISTOR 1608
R475	ERJ3GEYJ102V	100R RESISTOR 1608
R476	ERJ3GEYJ103V	10K RESISTOR 1608
R477	ERJ3GEYJ103V	10K RESISTOR 1608
R478	ERJ3GEYJ102V	1K RESISTOR 1608
R480	ERJ3GEYJ102V	1K RESISTOR 1608
R481	ERJ3GEYJ102V	1K RESISTOR 1608
R482	ERJ3GEYJ102V	1K RESISTOR 1608
R483	ERJ3GEYJ102V	1K RESISTOR 1608
R484	ERJ3GEYJ150V	15R RESISTOR 1608
R485	ERJ3GEYJ150V	15R RESISTOR 1608
R486	ERJ3GEYJ473V	47K RESISTOR 1608
R487	ERJ3GEYJ150V	15R RESISTOR 1608
R488	ERJ3GEYJ680V	68R RESISTOR 1608
R489	ERJ3GEYJ331V	330R RESISTOR 1608
R490	ERJ3GEYJ681V	680R RESISTOR 1608
R491	ERJ3GEYJ474V	470K RESISTOR 1608
R492	ERJ3GEYJ334V	330K RESISTOR 1608
R493	ERJ3GEYJ684V	680K RESISTOR 1608
R494	ERJ3GEYJ104V	100K RESISTOR 1608
R495	ERJ3GEYJ104V	100K RESISTOR 1608
R496	ERJ3GEYJ104V	100K RESISTOR 1608
R497	ERJ3GEYJ472V	4.7K RESISTOR 1608
R498	ERJ3GEYJ103V	10K RESISTOR 1608
R499	ERJ3GEYJ333V	33K RESISTOR 1608
R5	ERJ3GEYJ470V	47R RESISTOR 1608
R501	ERJ3GEYJ561V	560R RESISTOR 1608
R502	ERJ3GEYJ473V	47K RESISTOR 1608
R503	ERJ3GEYJ473V	47K RESISTOR 1608
R504	ERJ3GEYJ103V	10K RESISTOR 1608
R505	ERJ3GEYJ473V	47K RESISTOR 1608
R507	ERJ3GEYJ104V	100K RESISTOR 1608
R508	ERJ3GEYJ102V	1K RESISTOR 1608
R509	ERJ3GEYJ222V	2.2K RESISTOR 1608
R512	ERJ3GEYJ153V	15K RESISTOR 1608
R513	ERJ3GEYJ333V	56K RESISTOR 1608
R515	ERJ3GEYJ473V	47K RESISTOR 1608
R517	ERJ3GEYJ104V	100K RESISTOR 1608
R518	ERJ3GEYJ105V	1M RESISTOR 1608
R520	ERJ3GEYJ472V	4.7K RESISTOR 1608
R521	EVM7LSX00B24	0-20K VARIABLE RESISTOR
R522	ERJ3GEYJ823V	82K RESISTOR 1608
R523	ERJ3GEYJ471V	470R RESISTOR 1608
R524	ERJ3GEYJ224V	220K RESISTOR 1608
R525	EVM7LSX00B53	0-5K VARIABLE RESISTOR
R526	ERJ3GEYJ102V	1K RESISTOR 1608
R527	ERJ3GEYJ330V	120R RESISTOR 1608
R528	ERJ3GEYJ102V	1K RESISTOR 1608
R529	ERJ3GEYJ331V	330R RESISTOR 1608
R530	ERJ3GEYJ220V	22R RESISTOR 1608
R531	ERJ3GEYJ822V	8.2K RESISTOR 1608
R532	ERJ3GEYJ332V	3.3K RESISTOR 1608
R533	ERJ3GEYJ222V	2.2K RESISTOR 1608
R534	ERJ3GEYJ102V	1K RESISTOR 1608

REF	SERVICE NO	DESCRIPTION
R535	ERJ3GEYJ220V	22R RESISTOR 1608
R537	ERJ3GEYJ220V	22R RESISTOR 1608
R538	ERJ3GEYJ822V	8.2K RESISTOR 1608
R539	ERJ3GEYJ332V	3.3K RESISTOR 1608
R540	ERJ3GEYJ103V	10K RESISTOR 1608
R541	ERJ3GEYJ103V	10K RESISTOR 1608
R542	EVUF2AF15C54	VARIABLE RESISTOR
R545	ERJ3GEYJ105V	1M RESISTOR 1608
R546	ERJ3GEYJ473V	33K RESISTOR 1608
R547	ERJ3GEYJ472V	4.7K RESISTOR 1608
R548	ERJ6GEYJ472V	4.7K RESISTOR
R549	ERJ6GEYJ472V	4.7K RESISTOR
R550	ERJ6GEYJ472V	4.7K RESISTOR
R552	ERJ3GEYJ222V	12K RESISTOR 1608
R555	ERJ3GEYJ103V	10K RESISTOR 1608
R558	ERJ3GEYJ103V	10K RESISTOR 1608
R559	ERJ3GEYJ102V	1K RESISTOR 1608
R560	ERJ3GEYJ393V	39K RESISTOR 1608
R561	ERJ3GEYJ101V	100R RESISTOR 1608
R562	ERJ3GEYJ104V	100K RESISTOR 1608
R563	ERJ3GEYJ102V	1K RESISTOR 1608
R564	ERJ3GEYJ272V	2.7K RESISTOR 1608
R565	ERJ3GEYJ822V	8.2K RESISTOR 1608
R566	ERJ3GEYJ473V	47K RESISTOR 1608
R567	ERJ3GEYJ102V	1K RESISTOR 1608
R568	ERJ3GEYJ104V	100K RESISTOR 1608
R569	ERJ3GEYJ104V	100K RESISTOR 1608
R570	ERJ3GEYJ223V	22K RESISTOR 1608
R571	ERJ3GEYJ223V	22K RESISTOR 1608
R572	ERJ3GEYJ562V	5.6K RESISTOR 1608
R590	ERJ3GEYJ102V	1K RESISTOR 1608
RT101	B57620C104J62	THERMISTOR
SW1	AV442461	MICRO SWITCH
U101	MB15B23	BIPOLAR LINEAR IC
U301	MB1511FPT	PLL IC
U304	UA70002A	PA MODULE
U305	UY70003A	TCXO
U3101	SA616DK	FM DEMOD I/C
U401	UZ10001A	EEPROM 4KBITS
U402	M37702S1LGP	CELLULAR SIGNAL PROCESSOR
U403	UM10054A	LSI BIPOLAR MEMORY
U404	UM10056C1	EPROM 2MB
U405	TC7S04FUTE85L	INVERTER
U406	TC7S00FUTE85L	NAND GATE
U407	TC7S04FUTE85L	INVERTER
U408	TC7S02FUTE85L	NOR GATE
U409	UY10164A	STANDARD CELL LSI
U410	UUJ0029B	BASEBAND IC
U412	RN5VL32AATR	VOLTAGE DETECTOR
U413	UY10160A	POWER MANAGEMENT I/C
U414	TC7S66FUTE85L	SWITCH
U416	NJM3404AM	DUAL OP AMP
U417	TC4S30FTE85L	XOR GATE
U418	TC4S71FTE85L	OR GATE
U420	TC4S71FTE85L	OR GATE
U421	TC7W32FUTE85L	OR GATE
U422	LTC1044CS8T2	I/C
U423	TC7S32FUTE85L	OR GATE
U501	NJM3404AM	DUAL OP AMP
U502	NJM3404AM	DUAL OP AMP
U503	TC4S66FTE85L	I.C
U504	NJM3404AM	DUAL OP AMP
U506	UPC393G	I.C
U507	NJM555M	TIMER IC
U510	NJM3404AM	DUAL OP AMP
U512	TC4S66FTE85L	I.C
U513	TC4S71FTE85L	OR GATE
U514	TC4S71FTE85L	OR GATE
U515	LM7808CT	TIMER IC
W403	WW10019C	MIC WIRE (WHITE)

REF	SERVICE NO	DESCRIPTION
W404	WW10020C	MIC WIRE (BLACK)
X401	JS10003B	EPROM SOCKET
X402	90000230F1	EPROM CLIP
X403	5G10230A	W-FACE B
Y302	FS10037A	CRYSTAL (3.84MHZ)
U511	TA7805FTE85L	REGULATOR IC
U508	TA78L05FTE85L	REGULATOR IC
U509	TA78L05FTE85L	REGULATOR IC

10.2 Mecahnical Parts List

REF	SERVICE NO	DESCRIPTION
M1	1B70008A	BATTERY CASE SMALL
M101	5M70019A	BATTERY CASE (L)
M101	5M70019A	BATTERY CASE (DRY)
M101	5M70019A	HF CASE
M101	5M70019A	COVER (PANA)
M101	5M70019A	HHC CASE
M101	5M70019A	HHC CASE
M101	5M70019A	MIC HOLDER
M102	5N70014A	HF COVER
M102	5N70014A	BATTERY COVER (L)
M102	5N70014A	COVER
M102	5N70014A	MIC HOLDER
M102	5N70014A	LCD PANEL
M102	5N70014A	BATTERY COVER (DRY)
M102	5N70014A	COVER
M103	5E70039A	ANTENNA FINGER NUT
M103	5E70039A	MIC CUSHION
M103	5E70039A	RUBBER FOOT
M103	5E70039A	INDICATOR
M103	5E70039A	ANTENNA
M103	5E70039A	SP CUSHION
M104	5V10040A	MIC NAME PLATE
M104	5V10040A	RUBBER FOOT
M104	5V10040A	SP NET
M104	5V10040A	RUBBER FOOT
M105	5E70039A	RUBBER FOOT
M105	5E70039A	MIC NAME PLATE
M105	5E70039A	HF FIXING HOOK
M105	5E70039A	RUBBER FOOT
M106	5R70011A	RUBBER FOOT
M106	5R70011A	VOLUME KNOB
M106	5R70011A	POLY BAG
M106	5R70011A	RECEIVER TUBE
M106	5R70011A	RUBBER FOOT
M107	1EA5094B	RECEIVER CONTACT
M107	1EA5094B	RADIATOR
M107	1EA5094B	SCREW
M107	1EA5094B	RUBBER FOOT
M108	1BC5819A	RECEIVER CONTACT
M108	1BC5819A	HF - PLATE
M109	5U70009A	RECEIVER RETAINER
M109	5U70009A	BOTTOM CUSHION
M110	5U70008B	TOP CUSHION
M110	5U70006A	LCD CUSHION
M111	5S70007B	LCD BACKLIGHT
M112	5V70011D	KEYBOARD PANA
M112	5Y70025A	HF BLIND COVER
M113	4D70001E	CHASSIS
M114	1B70011A	PCB CLIP
M115	1B70011A	PCB CLIP
M117	1B70010A	ANTENNA FINGER
M118	5M70016C	UKJ CASE
M121	1B70009C	BATTERY CONTACT 1
M122	1B70009C	BATTERY CONTACT 1
M123	1B70009C	BATTERY CONTACT 1
M124	7X70030A	NAME PLATE
M127	5U70021A	MIC CUSHION

REF	SERVICE NO	DESCRIPTION
M128	6V10032A	RECEIVER NET
M129	6V10029A	BUZZER NET
M151	5H10222A	UKI INSULATOR
M152	5U10041A	CUSHION
M2	4G32105	BATTERY COVER SMALL
M200	1D70015A	BATTERY TERMINAL
M201	1D70009A	SP BRACKET
M201	1D70009A	CHARGER TERMINAL
M201	1D70009A	BATTERY TERMINAL
M201	1D70009A	BATTERY TERMINAL
M201	1D70009A	CHARGER TERMINAL
M202	1B70016A	BATTERY TERMINAL
M202	1B70016A	CHARGER TERMINAL
M202	1B70016A	CHARGER TERMINAL
M202	1B70016A	BATTERY TERMINAL
M202	1B70016A	SPEAKER BRACKET
M203	1D70010A	CHARGER TERMINAL
M203	1D70010A	ANTENNA TERMINAL
M203	1D70010A	BATTERY TERMINAL
M203	1D70010A	UKJ BATTERY NAME PLT (L) PANA
M203	1D70010A	ANTENNA TERMINAL
M203	1D70010A	BATTERY TERMINAL
M203	1D70010A	NAME PLATE BATTERY (S)
M203	1D70010A	CONTACT TERMINAL
M204	1D70013A	CONTACT TERMINAL
M204	1D70013A	ANTENNA TERMINAL
M204	1D70013A	CONTACT TERMINAL
M204	1D70013A	BATTERY (L) SPONGE
M204	1D70013A	BATTERY CONTACT LINK
M204	1D70013A	ANTENNA TERMINAL
M205	1B70015A	FLEXIBLE PCB
M205	1B70015A	BATTERY CONTACT SPRING
M205	1B70015A	PRESSURE PLATE
M205	1B70015A	BATTERY (L) SPONGE
M205	1B70015A	CONTACT TERMINAL
M206	1D70017A	BATTERY CONTACT SPRING
M207	7X70039A	NAME PLATE BATTERY (DRY) PANA
M3	4R13358	BATTERY TERMINAL
M301	7X70028A	NAME PLATE (BTC)
M301	7X70028A	NAME PLATE
M301	7X70028A	NAME PLATE (HHC)
M4	XTB2510AFN	BATTERY TERMINAL
M401	XTB38GFX	TAPPING SCREW
M402	XTB38GFX	TAPPING SCREW
M403	XTB38GFX	TAPPING SCREW
M404	XTB38GFX	TAPPING SCREW
M405	XSB36FX	SCREW
M406	XSB36FX	SCREW
M407	XSB320FX	SCREW
M408	XSB3+14FX	SCREW
M7	1B70011A	SERIAL N
M701	3G24152B	BRACKET
M702	3G24157B	BRACKET
M703	XVG48F2	SCREW
M704	XVG48F2	SCREW
M705	XWG4FXK	WASHER
M706	XWG4FXK	WASHER
M707	XWA4FXK	SPRING WASHER
M708	XWA4FXK	SPRING WASHER
M710	XSB410FXK	SCREW
M711	XSB425RFXK	SCREW

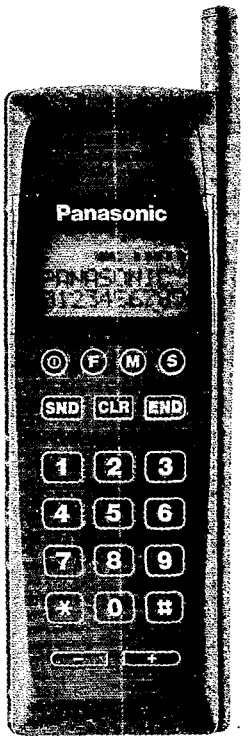
Order Number: MCUK940101G2

Technical Guide

Personal Cellular Telephone

Handheld Unit

EB-3650
EB-3651
EB-3652
J Series



Panasonic

MCUK-TSD-503 TG Iss 1 Rev 0

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NATIONAL ACCREDITATION OF CERTIFICATION BODIES
Certificate No FM13397

WARNINGS AND CAUTION

1. The equipment described in this manual contains polarised capacitors utilising liquid electrolyte. These devices are entirely safe provided that neither a short-circuit nor a reverse polarity connection is made across the capacitor terminals. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT OR, AT WORST, POSSIBLE INJURY TO PERSONNEL RESULTING FROM ELECTRIC SHOCK OR THE AFFECTED CAPACITOR EXPLODING. EXTREME CARE MUST BE EXERCISED AT ALL TIMES WHEN HANDLING THESE DEVICES.
2. The equipment described in this manual contains electrostatic sensitive devices (ESDs). Damage can occur to these devices if the appropriate handling procedure is not adhered to.
3. **ESD Handling precautions**
   A working area where ESD sensitive devices may be safely handled without undue risk of damage from electrostatic discharge, must be available. The area must be equipped as follows:
   Working Surfaces - All working surfaces must have a dissipative bench mat, SAFE for use with live equipment, connected via a 1MΩ resistor (usually built into the lead) to a common ground point.
   Wrist Strap - A quick release skin contact device with a flexible cord, which has a built in safety resistor of between 5kΩ and 1MΩ shall be used. The flexible cord must be attached to a dissipative earth point.
   Containers - All containers and totage must be of the conductive type.

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ENGLAND

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Amendment Record

The information provided in this Technical Guide is issued in March 1994. Amendments to this manual will be updated by the use of an Amendment Instruction Sheet, together with the amended sheet(s) for insertion into the manual. Carry out the amendment instructions and enter the appropriate details in the Amendment Record below.

Amendment Number	Amended by	Date

1 SPECIFICATIONS

1.1 Ratings

No.	Item	Specifications
1	Frequency range	872.0125MHz to 949.9875MHz
2	Transmit/Receive frequency separation	45MHz
3	RF channel spacing	25kHz
5	Antenna terminal impedance	50Ω
6	RF output power	0.6W
7	Power source	+4.8V DC (negative ground)
8	Operating temperature	-10°C to +55°C
9	Power consumption: Transmit Standby	 +4.8V Approx. 500mA at 0.6W +4.8V Approx. 45mA
10	Dimensions (W x H x D)	145mm x 48mm x 26mm - with 600mAh battery fitted 145mm x 48mm x 32mm - with 900mAh battery fitted
11	Weight	270g - with both batteries
12	Volume	175cc - with 600mAh battery fitted 195cc - with 900mAh battery fitted

1.2 Characteristics

1.2.1 Transmitter

No.	Item	Specifications		
1	Frequency range	872.0125MHz to 904.9875MHz		
2	Frequency stability	< ±2.5PPM		
3	Channel switching time:	Adjacent channel Non-adjacent channel	< 10ms < 40ms	
4	Carrier inhibiting time	< 2ms		
5	RF output power	0.6W		
6	RF output power control	Power Level 2 3 4 5 6 7	Attenuation 2dB 6dB 10dB 14dB 18dB 22dB	Power 27.8dBm 23.8dBm 19.8dBm 15.8dBm 11.8dBm 7.8dBm
7	RF output power tolerance	< +2dB, > -4dB		
8	RF power transition time	< 20ms		
9	Carrier on-off time	< 2ms		
10	Modulation deviation limit	±9.5kHz		
11	Modulation noise and distortion	< -26dB		
12	Harmonic and spurious emission conducted	< -41dB		
13	Transmit-audio filtering:	400 to 2,250Hz 300Hz 2,500Hz 3,000Hz 200Hz 3,500Hz	< +1dB, > -1dB < +1dB, > -3dB < +1dB, > -2dB < +1dB, > -6.5dB < 24dB/oct +1dB > -30dB /oct	
14	SAT frequency deviation	1.7kHz ±10%		
15	Audio voice muting level	> 40dB		

1.2.2 Receiver

No.	Item	Characteristics	
1	Frequency range	917.0125MHz to 949.9875MHz	
2	Distortion	< -26dB	
3	Hum and noise	< -32dB	
4	RSSI Vo voltage	0.5 ≤ Vo ≥ 2.0v	
5	Selectivity	< 55dB +25kHz, > -25kHz	
6	Spurious response	> -55dB	
7	RF sensitivity	> -110dBm	
8	Receive-audio filtering	400 to 2,250Hz 360Hz 300Hz 240Hz 3,000Hz 200Hz > 3,800Hz <	< +1dB, > -1dB < +1dB, > -2dB < +1dB, > -6.5dB < +1dB < +1dB , > -3dB > +24dB / oct-1dB < -36dB / oct+1dB
9	Inter-modulation response	> 55dB	

2 TECHNICAL DESCRIPTION

2.1 General

The Panasonic Handheld Portable Telephone consists of the parts shown below, in Figure 2.1-1.

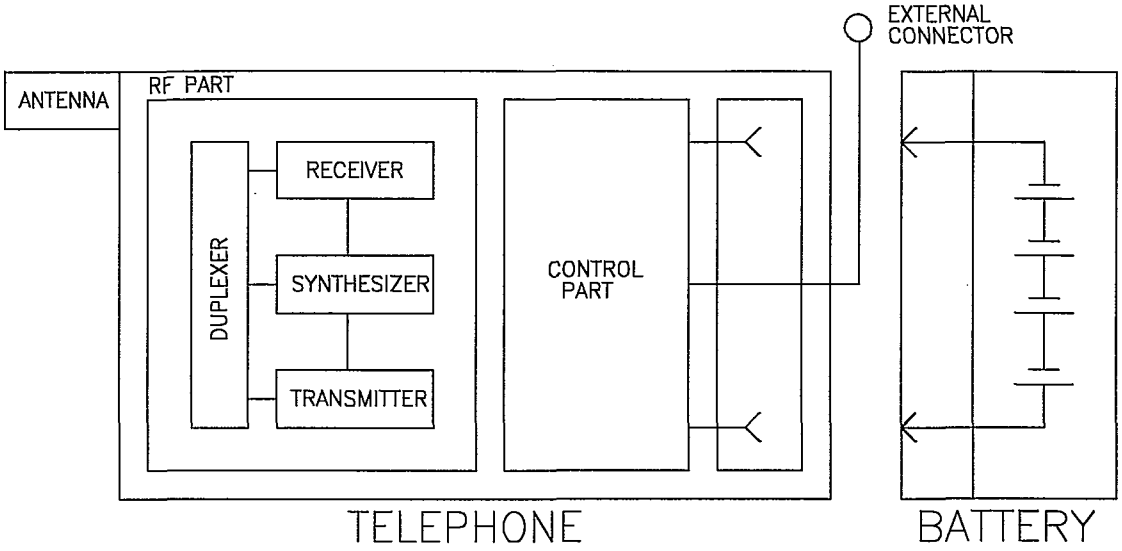


Figure 2.1-1: Handheld portable telephone

2.2 Antenna

The length of the antenna is 110mm.

2.3 Duplexer

The Duplexer is a highly selective filter that performs the following functions:

1. Prevents RF output power from the transmitter entering the RF amplifier in the receiver, which would reduce receiver sensitivity.
2. Reduces transmitter carrier noise and thus prevents reduction of receiver sensitivity during transmission.
3. Reduces harmonic and spurious emissions of the transmitter.
4. Reduces single signal interference. The attenuation characteristics of the duplexer are shown in Table 2.3-1 and Figure 2.3-1.
5. The transmitter filter is designed as notch filter and the receiver filter is designed as band pass filter.

Item	Tx Side		Rx Side	
Pass-band Frequency	872.0125MHz to 904.9875MHz		917.0125MHz to 949.9875MHz	
Insertion Loss	3.5dB >		6.0dB >	
Ripple	1.8dB >		1.8dB >	
VSWR	2.0 >		2.0 >	
Attenuation	Frequency (MHz) 917 to 950	Attenuation (dB) 45 <	Frequency (MHz) 872 to 905	Attenuation (dB) 50

Table 2.3-1: Duplexer Characteristics

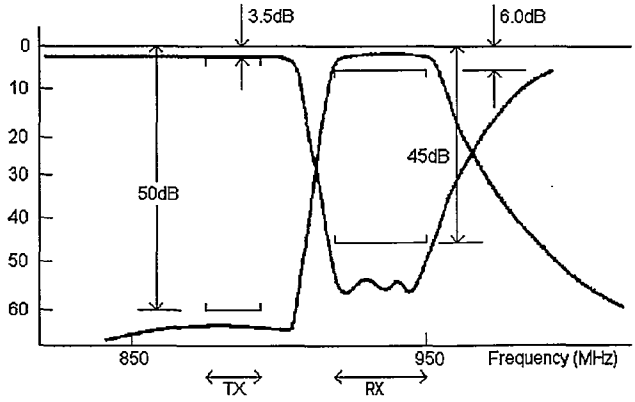


Figure 2.3-1: Attenuation of duplexer

2.4 Transmitter

2.4.1 General

Refer to the RF Unit block diagram and schematic diagram.
The transmitter consists of the PA module, APC Unit (Q102), Directional Coupler, Detector, Attenuator, Power Control Regulator, Exciter Amplifier and Band-Pass Filters.

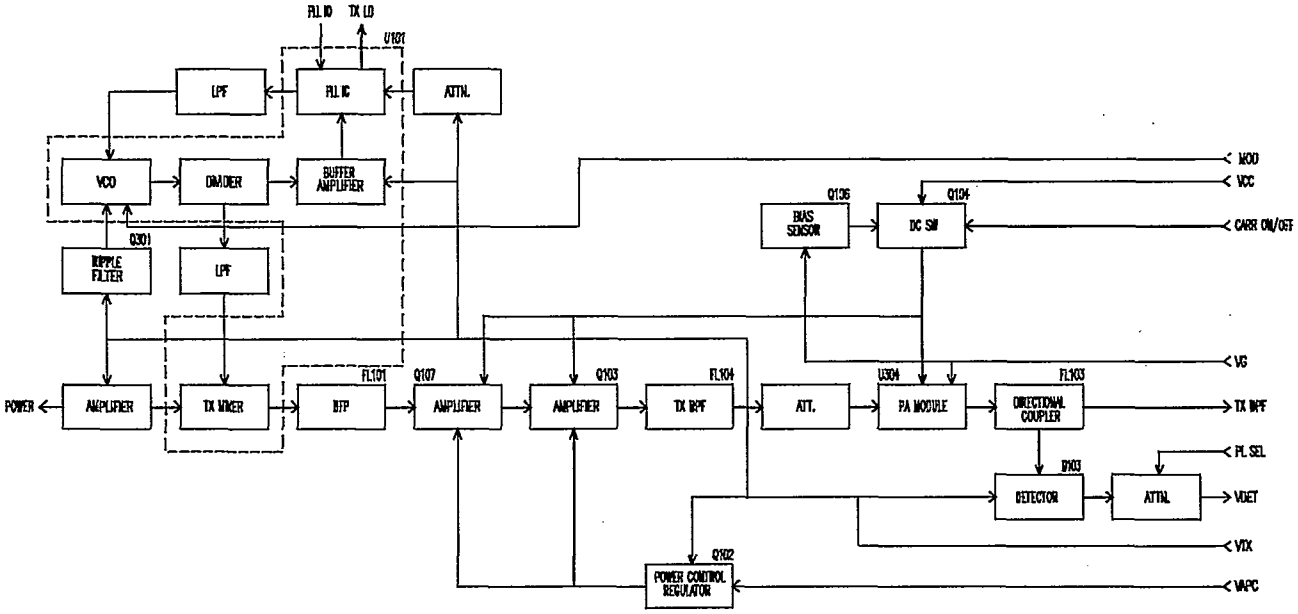


Figure 2.4.1-1: Transmitter block diagram

The Transmitter has the following features:

1. An input power of 17dBm is required for 1.3W output of power from the PA module.
2. RF output power is stable over 20dB range.
3. Alignment is achieved with electronic level adjustment for each power level.
5. Transmitter Stage Gain is shown in Figure 2.4.1-2.
4. Transmit frequency is produced at Tx Mixer by mixing the Tx Mod module output (135.7375MHz, modulated signal) and local synthesiser output signal.

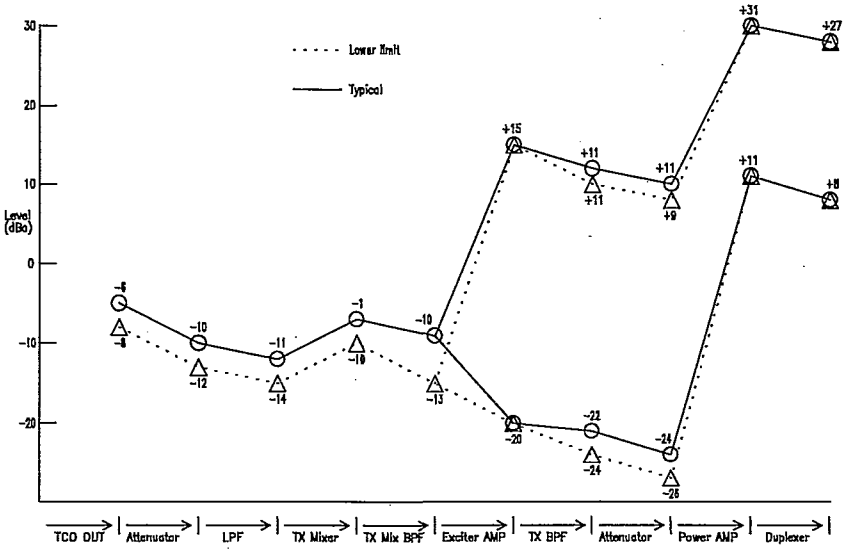


Figure 2.4.1-2: Transmitter stage level diagram

2.4.2 Tx Mixer and Tx Amplifier Circuit

This section generates and amplifies the Tx frequency. MODULATOR IC (U101) includes a MIXER, VCO and PLL circuit which mixes a Tx modulated signal (135.7375MHz) and the local oscillator (1007.75 to 1040.725MHz). The mixer output includes harmonics, which are removed by BPF (FL101).

The Tx Amplifier section (Q107 and Q103), which amplifies the Tx frequency signal to the PA module drive level.

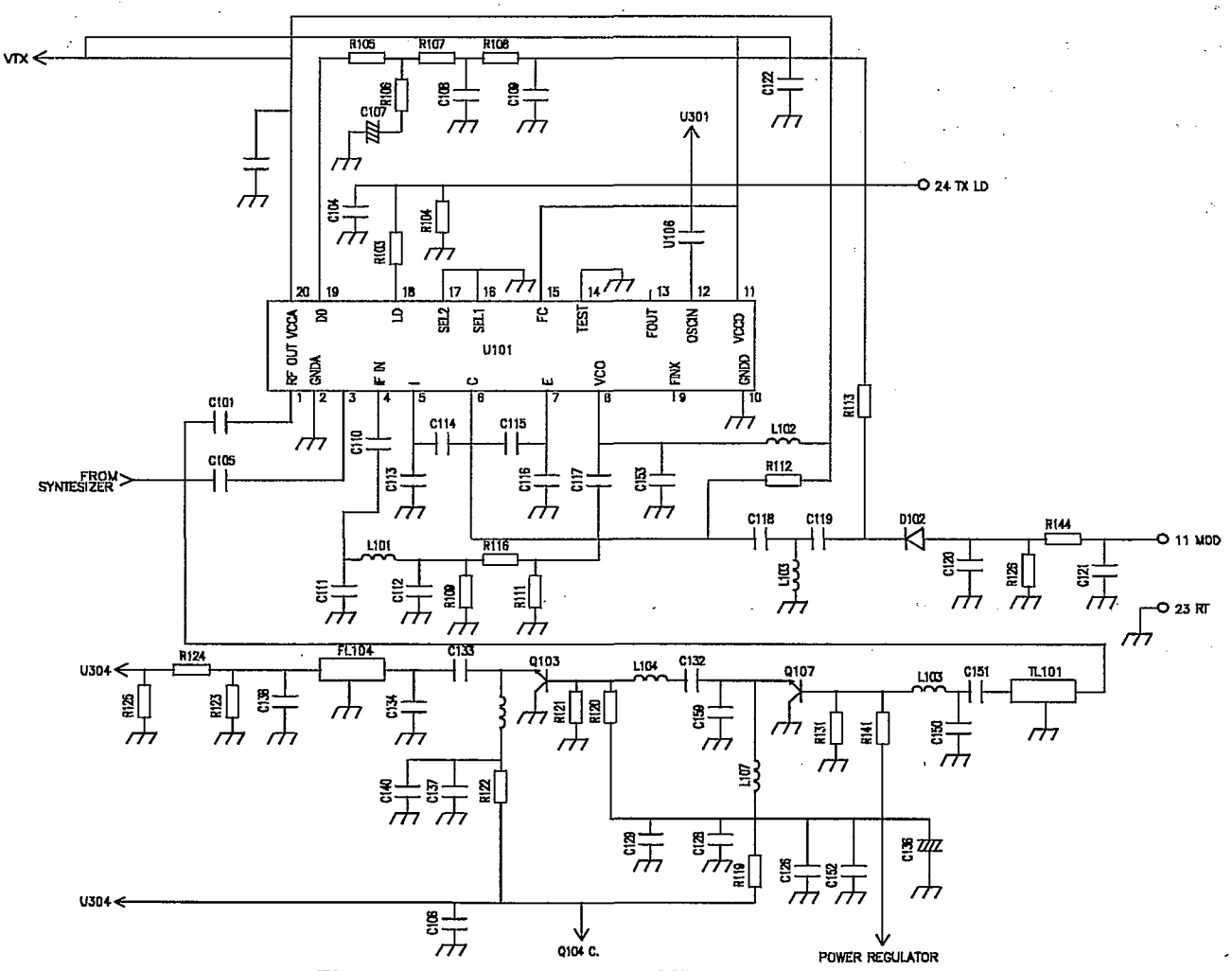


Figure 2.4.2-1: Tx Mixer and Tx amplifier circuit

Q107 has approximately 13dB gain and Q103 has approximately 13dB gain.

The Tx Amplifier section is gain controlled by the APC signal to control the Tx output of the PA module. Q102 is the APC control transistor.

The output signal of Q103 includes harmonics and spurious elements and is filtered by FL104.

The power to the Tx Mixer and Tx Amplifier is turned on when the transmitter is activated.

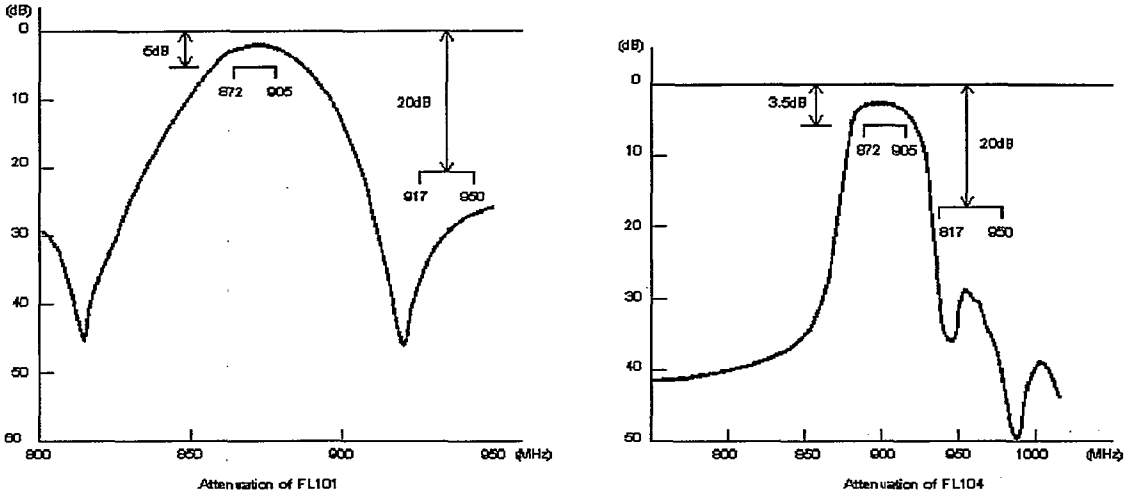


Figure 2.4.2-2: BPF characteristics

2.4.3 PA Module

The PA module (U304) has two power amplifiers built in, with a total gain of approximately 25dB and a total power efficiency of approximately 60%. Both amplifiers use GaAs MOS FETS and operate in class C.

The Amplifier Drain and Gate Voltages are:

First amplifier: VD1 = 4.8V DC

Final amplifier: VD2 = 4.8V DC

Gate bias: VG1 = -3.5V DC

(Caution: Do not apply a positive voltage to Gate bias.)

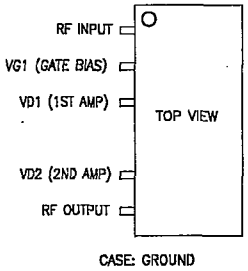


Figure 2.4.3-1: PA module

2.4.4 Directional Coupler and Detector Circuit

The directional coupler is made from a multi-layer ceramic chip and is sensed by the output from the PA module.

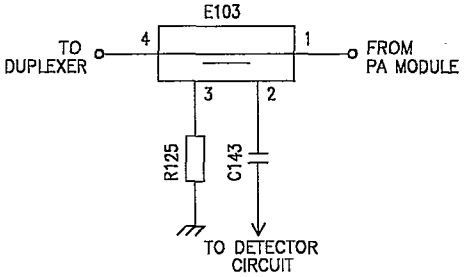


Figure 2.4.4-1: Directional coupler

The sensed PA module output is applied to the detector circuit (D103) which is a silicon schottky barrier diode.

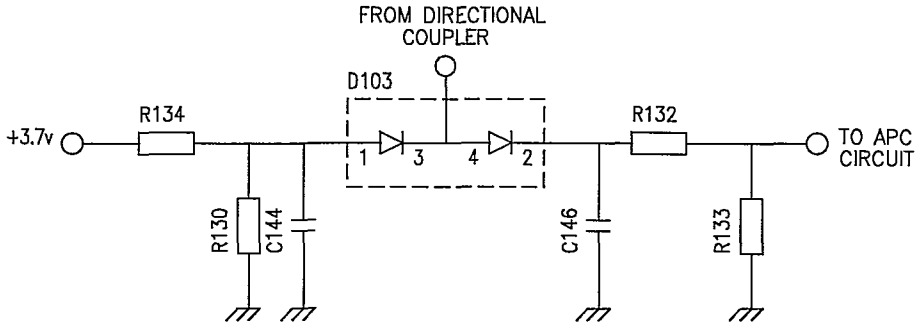


Figure 2.4.4-2: Switchable detector circuit

2.4.5 APC Unit and APC Circuit

The APC (Automatic Power Control) Circuit consists of U407, Q102, Q107, Q103, U102 and D103.

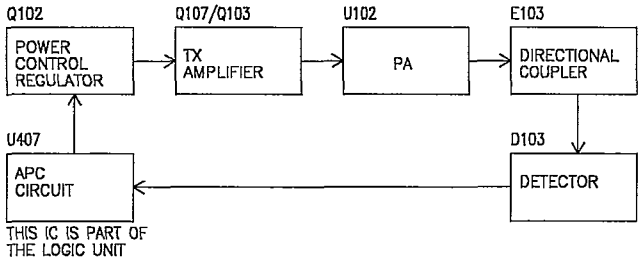


Figure 2.4.5-1: APC circuit

Voltage Control Transistor's (Q102) collector output voltage is supplied to base bias of the Tx Amplifiers, Q107 and Q103.

The System Signal Processor (U409) also contains the APC control circuit.

The power step voltage reference level from U4097 Pin 99 is applied to Q102.

The detected RF power level is applied to U409 Pin 98.

Gate bias circuit for the PA module is a part of the control section.

U422 is a switched capacitor voltage converter which generates a negative voltage that is the inverse of VD. This voltage is used as PA module gate bias source and negative supply VGLCD to the LCD DS401.

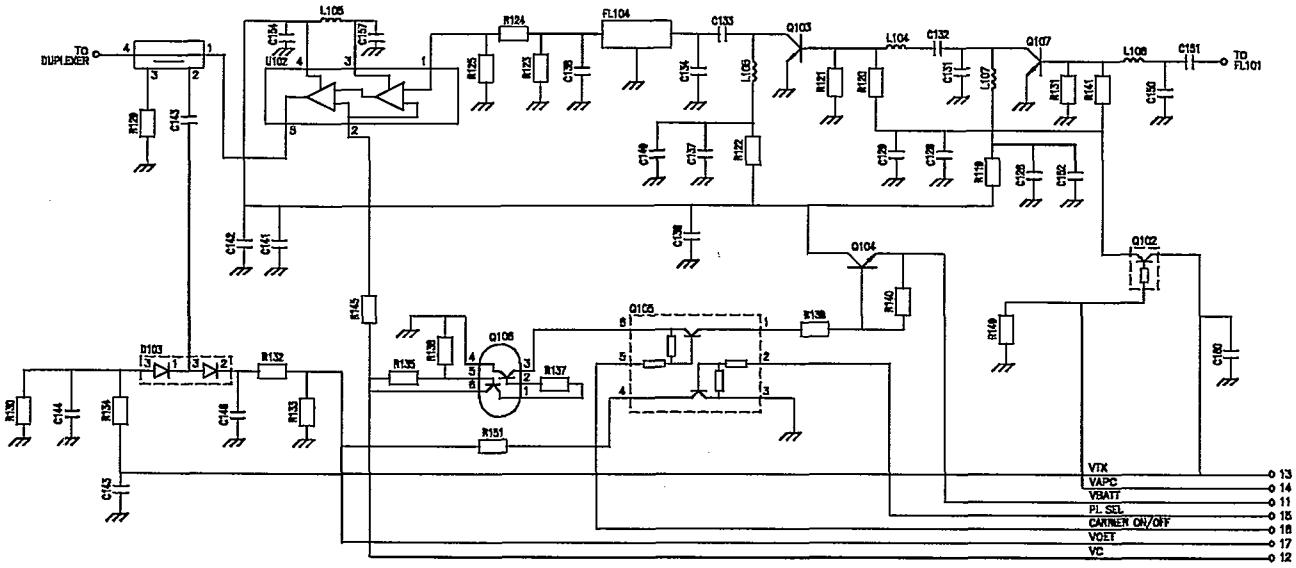


Figure 2.4.5-2: APC circuit and APC unit schematic diagram

Q105 is a DC switch which when the CARR ON signal comes from the control unit turns ON.

Q106 is a Bias Sensor. If there is no gate bias the PA will not turn on, thus preventing damage.

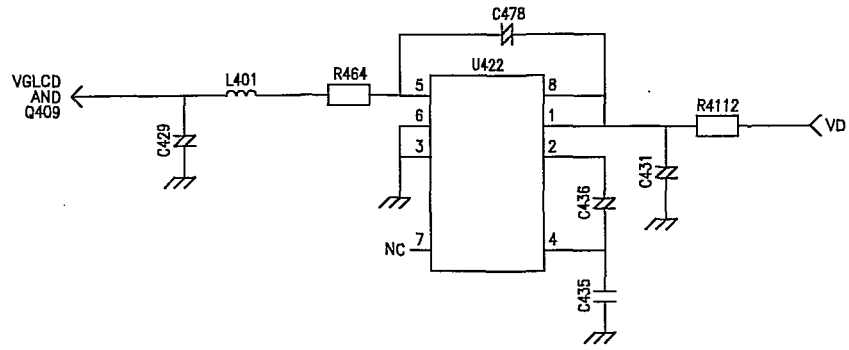


Figure 2.4.5-3: Gate bias circuit

2.4.6 Carrier ON-OFF Circuit

The Carrier ON-OFF Circuit consists of Q104 and Q105 as shown in Figure 2.4.6-1.

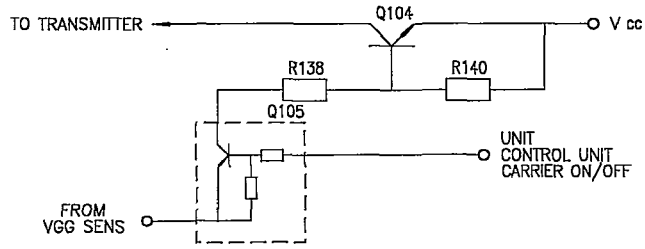


Figure 2.4.6-1: Carrier ON/OFF circuit

Q104 and Q105 are switched on when the Carrier ON-OFF signal comes from the Control Unit and VGG SENS signal comes from the APC Block. First Q105 turns ON, then Q104 turns ON. The relationship between switching Q105 and Q104 ON/OFF and VGG signals is shown in Table 2.4.6-1.

		Carrier ON/OFF high	
		Q105	Q104
VGG SENS	1	OFF	OFF
	0	ON	ON

Table 2.4.6-1: Q105 and Q104 Switching Table

2.5 Receiver

2.5.1 General

Refer to RF Unit block diagram and schematic diagram. The receiver consists of an RF Amplifier, 1st Mixer, 1st IF BPF, 2nd IF Filter, and 2nd Local Oscillator as shown in Figure 2.5.1-1.

The Receiver has the following functions:

1. The 1st IF frequency is 90.7375MHz and the 2nd IF frequency is 462.5kHz.
2. The 2nd IF Amplifier, Frequency Discriminator and RSSI detector are contained in the Base-band IC.
3. 3.7V is always supplied to Base-band IC as V_B.
4. Times 6 multiplier generates 2nd local signal by multiplying the TCXO frequency.
5. Rx PSC and RGC are power saving control signals.
   Rx PSC is for interval receiving and RGC is for changing the front-end block biasing.
   These two signals are software controlled.

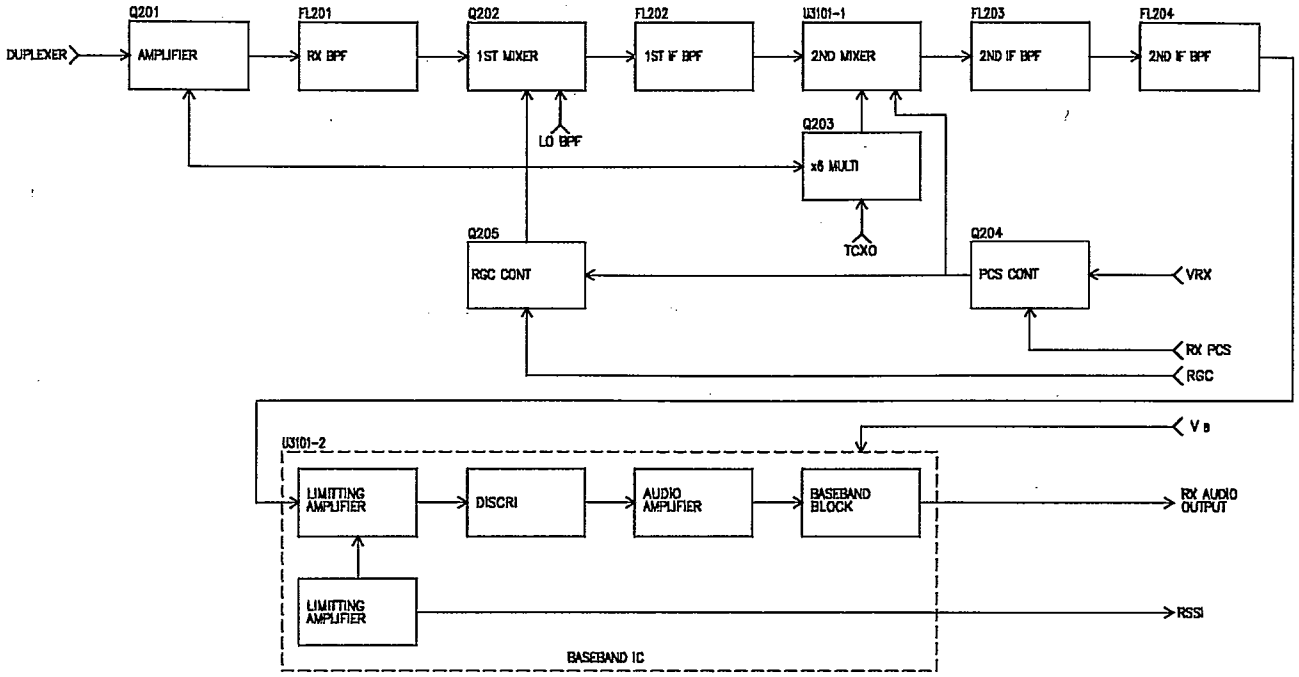


Figure 2.5.1-1: Receiver circuit

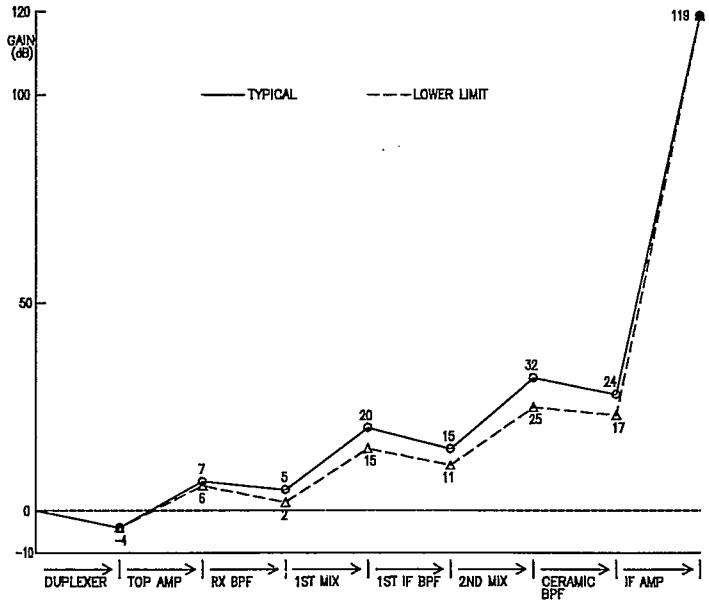


Figure 2.5.1-2: Receiver stage gain diagram

2.5.2 RF Amplifier

The RF amplifier consists of Q201 which has a gain of approximately 10dB.

The input and output impedances are matched to 50Ω.

The RF amplifier is a high frequency, low noise, and high gain transistor.

The RF amplifier circuit is shown in Figure 2.5.2-1.

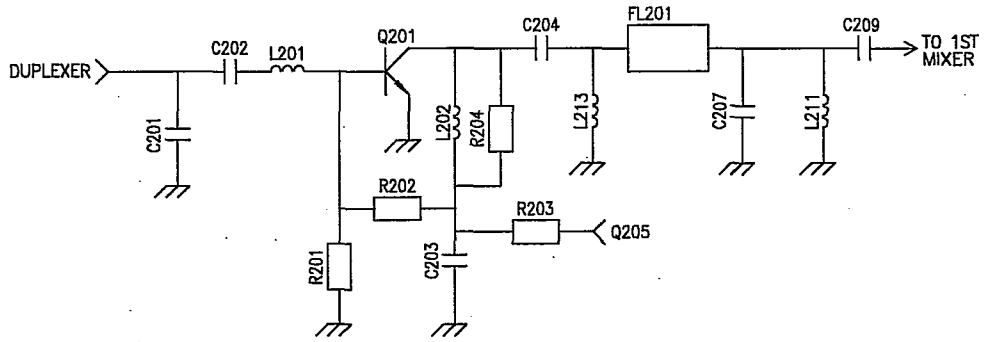


Figure 2.5.2-1: RF amplifier circuit

2.5.3 Rx Band Pass Filter

The Rx BPF (FL201) is matched to 50Ω.

The characteristics of this filter are shown in Figure 2.5.3-1.

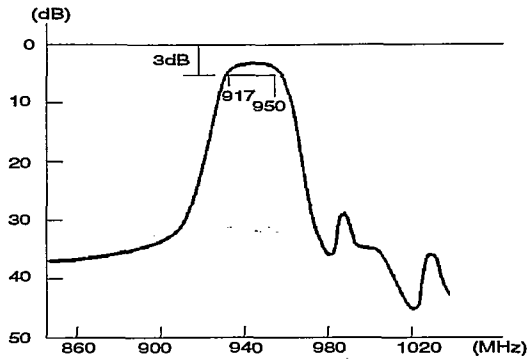


Figure 2.5.3-1: Attenuation of Rx SAW BPF

2.5.4 Mixer and 1st IF Filter

The 1st IF Filter consists of FL202.

The mixer (Q202) is base injection.

The output of the RF BPF and the output of the 1st Local OSC from the synthesiser are mixed to produce a 1st IF signal of 90.7375MHz.

The impedances of the input and output ports are:
RF input port: 50Ω
Local input port: 50Ω
1st IF output port: 430Ω

The 1st IF Filter is a 90.7375MHz SAW type filter with an input and output impedance of 430Ω and an insertion loss of approximately 4dB.

The 1st Mixer conversion gain is approximately 15dB (SAW Filter loss is not included).

The 1st mixer and 1st IF Filter blocks are shown in Figure 2.5.4-1.

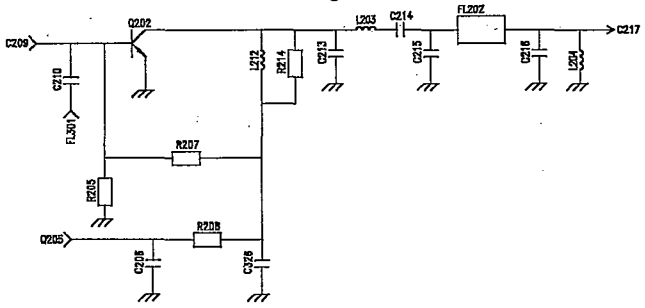


Figure 2.5.4-1: First mixer and IF filter circuit

2.5.5 IF System Amplifier and Discriminator

The IF System Amplifier and Discriminator consists of U3101.

The 1st IF signal output of FL202 and the 90.2MHz output of 2nd Local Oscillator are mixed to produce a 2nd IF signal of 462.5kHz.

The output band width of the 2nd Mixer is limited by two ceramic filters FL203 and FL204.

2.5.6 Times 6 Multiplier

Times 6 multiplier generates 91.2MHz 2nd local frequency by multiplying TCXO output of 15.2MHz.

Accuracy of the output is dependent on the TCXO stability but is within ±2.5ppm within the specified temperature range.

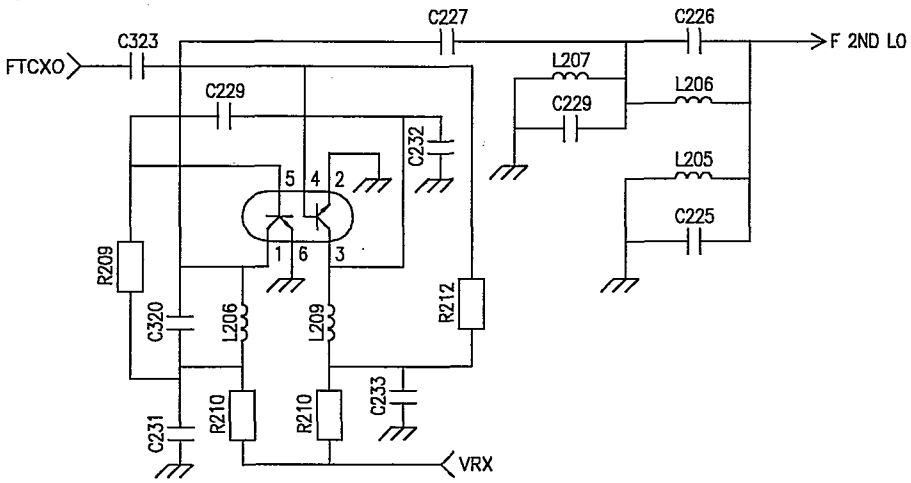


Figure 2.5.6-1: Times 6 multiplier circuit

2.6 Synthesiser

2.6.1 Local synthesiser

The synthesiser consists of a Reference Frequency Oscillator PLL IC, Ripple filter Voltage Controlled Oscillator (VCO), buffer amplifier and divider. The schematic diagram is shown in Figure 2.6.1-1 and Figure 2.6.1-2.

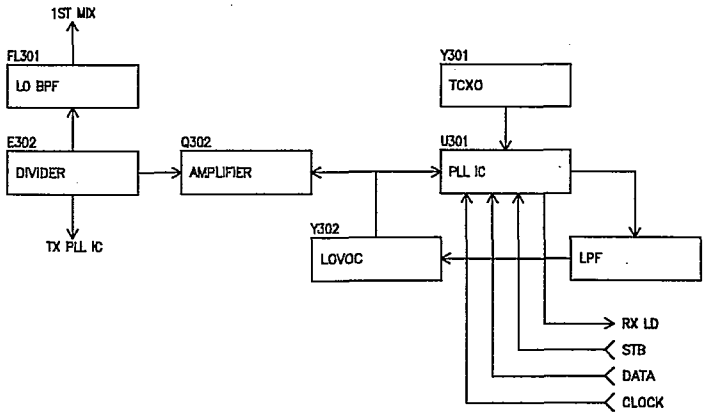


Figure 2.6.1-1: Synthesiser block diagram

Frequency measurement can be done by the use of a pick up coil which is made from 2 or 3 turns of copper wire, to prevent circuit unlock.

It may not be able to measure if you make a connection to the synthesiser, because the closed loop circuit condition may be changed.

The synthesiser which is a part of the RF Unit board consists of a Temperature Compensated Crystal Oscillator (TCXO), operating at 15.2MHz, and two independent Frequency synthesisers, one for local oscillator and the other is for the transmit oscillator. The local synthesiser generates 1007.75 to

1040.725MHz receiver local oscillator signal which is 90.7375MHz higher than the 917.0125 to 949.9875MHz receiver frequency.

PLL IC U301 receives channel data from the control section and output tuning voltage to the VCO (Y302).

VCO will oscillate at 1007.75 to 1040.725MHz local frequency, the nominal output level is -3dBm.

Q302 is an amplifier this is used to amplify the VCO output before dividing by FL302.

FL302 divides the 1st local signal to the receiver 1st mixer and transmitter modulator.

Q301 is a ripple filter for the synthesiser source power.

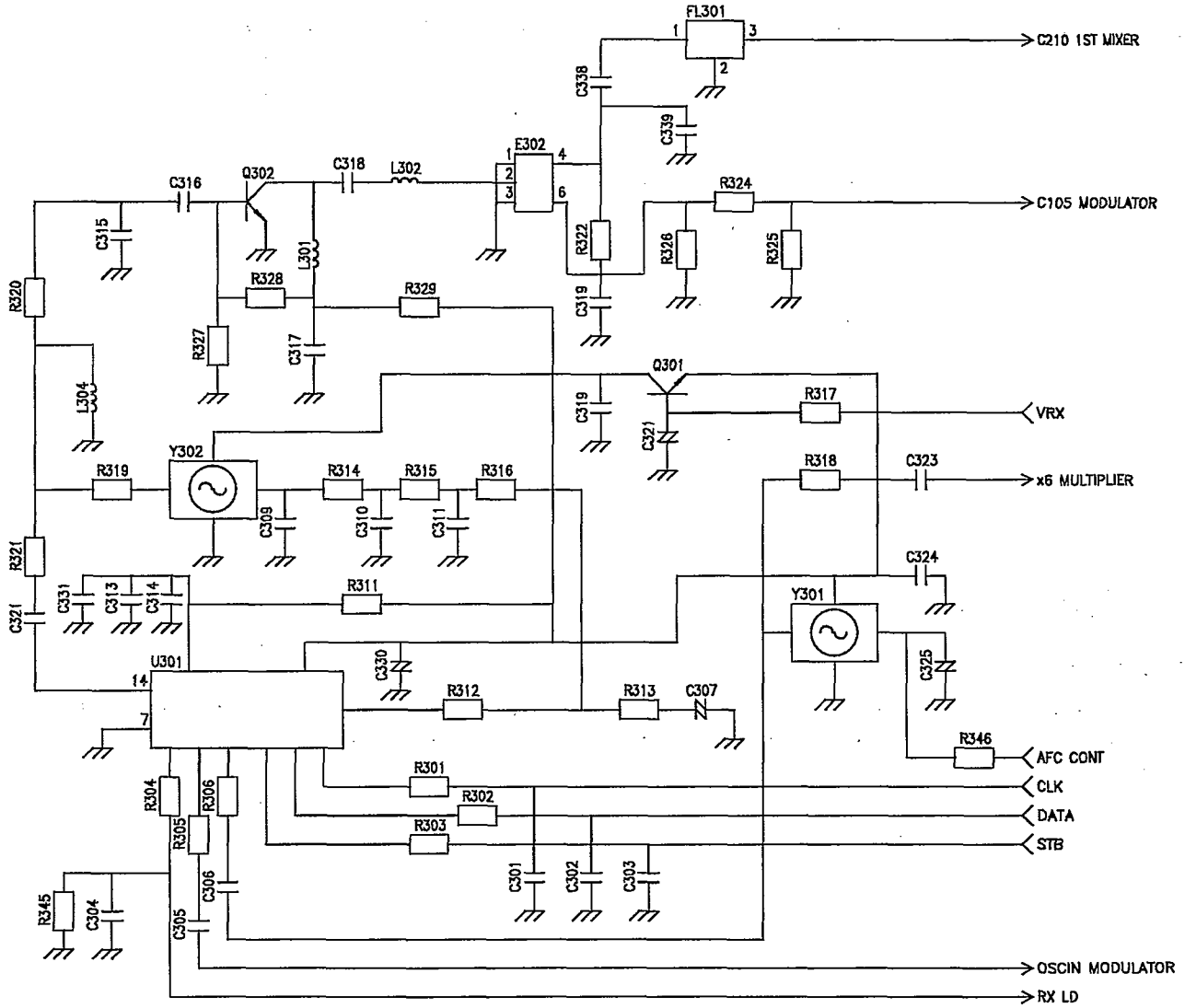


Figure 2.6.1-2: Synthesiser circuit diagram

2.6.2 TCXO

Y301 is a Temperature Compensated Crystal Oscillator (TCXO). The frequency of the TCXO is controlled to 15.2MHz ±2.5ppm over the temperature range of -10°C to +55°C. The output of the TCXO is used as the reference frequency for the Phase Locked Loop (PLL) circuit in the local frequency synthesiser and modulator synthesiser.

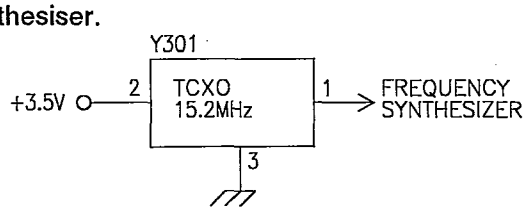


Figure 2.6.2-1: TCXO

2.6.3 Tx Synthesiser Circuit

U101 contains not only the synthesiser but also the Tx mixer and VCO.

The Tx synthesiser receives transmitted audio and data signals from the control unit, and produces the FM Carrier Signal, which is fed to the Tx mixer.

The output level from the synthesiser is about +1.5dBm with an the output impedance is 50Ω nominal and a the current consumption is approximately 30mA.

This circuit block needs no clock, data or strobe, because the PLL IC includes fixed frequency data. Therefore, this circuit will lock to the desired frequency when power is turned on.

The block diagram of the Tx synthesiser is shown in Figure 2.6.3-1.

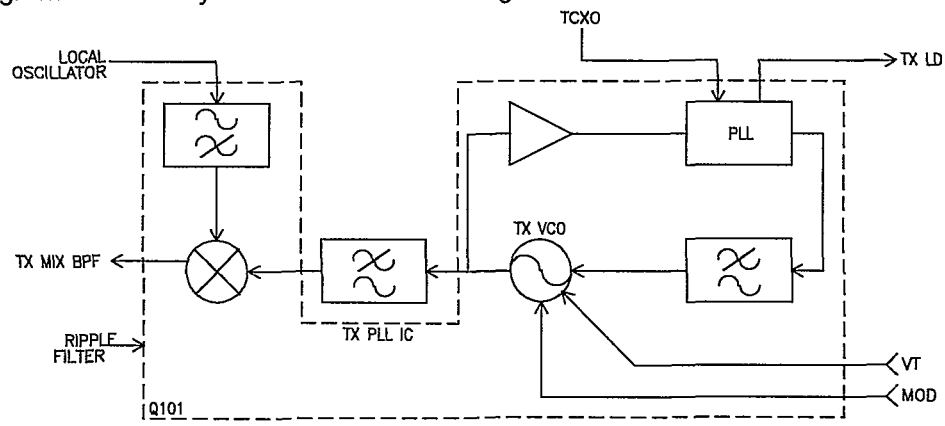


Figure 2.6.3-1: Tx modulator block diagram

2.7 CONTROL UNIT

2.7.1 CPU (U402)

The CPU is a high-performance silicon gate CMOS, 16 bit microprocessor.

The CPU contains 512 bytes of RAM, a 16 bit multi-function timer, two serial communication interfaces (UART), 68 programmable input/output lines and an 8 channel, and 8 bit analogue to digital converter.

The CPU controls most of the functions in the personal cellular telephone.

2.7.2 ROM (U404)

The main operating program for the CPU is contained in the 2M bit programmable read-only memory which has a fast access time and is an ultraviolet erasable.

2.7.3 RAM (U403)

The RAM has a 256K random access read/write memory area, which is used to store repertory dial numbers and as a temporary memory for the CPU.

The RAM has a fast access time and is always backed up by a vanadium lithium rechargeable battery even under the power-OFF state.

2.7.4 Cellular System Signal Processing (U409)

Figure 2.7.4-1 shows a Block Diagram of U409.

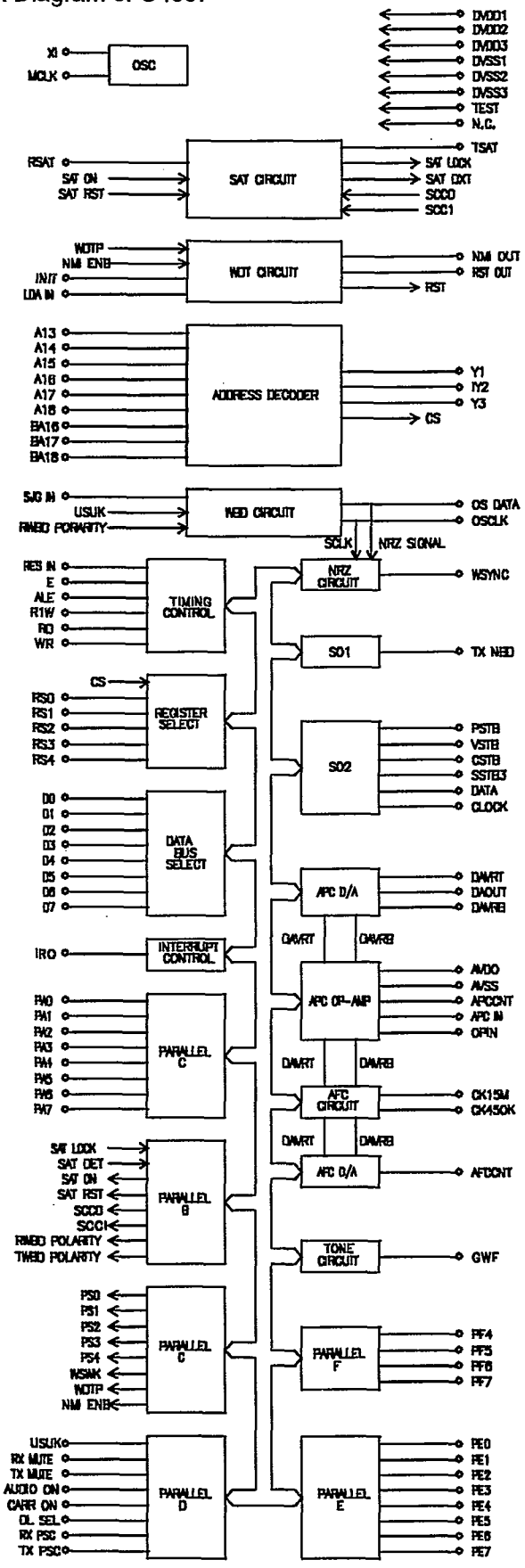


Figure 2.7.4-1: Block diagram of U409

The Cellular System Signal Processing IC is an LSI that is used for AMPS/TACS signal processing applications.
The IC includes clock generation for each circuit supply, non return to zero code processing, wide band data demodulation, watch dog timer, 8 bit analogue to digital convert, auto frequency control circuit and the following:

1. **Parallel Interface**
   There are 4 parallel ports: PA, PB, PC, PD, and PD. PA and PB are 8 bit input/output ports, and PC and PD are 8 bit dedicated output ports. PB and PC are used for internal control.
2. **Serial Interface**
   The serial interface has 2 ports (S01 and S02). S01 transmits non return to zero (NRZ) codes and S02 transmits electronic volume data, DTMF tone control data and commander control data, as well as the synthesiser channel control data.
3. **Watch Dog Timer**
   The Watch Dog Timer circuit monitors the operation of the CPU. The CPU resets the timer repeatedly to ensure that the timer never fails as long as the CPU operates in its proper sequence. If the timer fails this circuit outputs a reset pulse to reset the CPU to its initial state.
4. **Wide-band Data Demodulation Circuit**
   This circuit converts the wide-band Manchester data to NRZ data.
5. **NRZ Code Processing**
   The NRZ code processing circuit takes a 3 of 5, or greater, majority decision of the NRZ code from the WBD demodulation circuit. The WBD demodulation performs a 1 bit correction with the BCH (40.28;5) decoding circuit, and transfers the information bits (28 bits) not including the check bits (12 bits) to the external CPU.

2.7.5 Base-band Signal Processing (U410)

The Base-band Signal Processing IC is an LSI is used for the AMPS/TACS cellular system mobile phone base band processing.

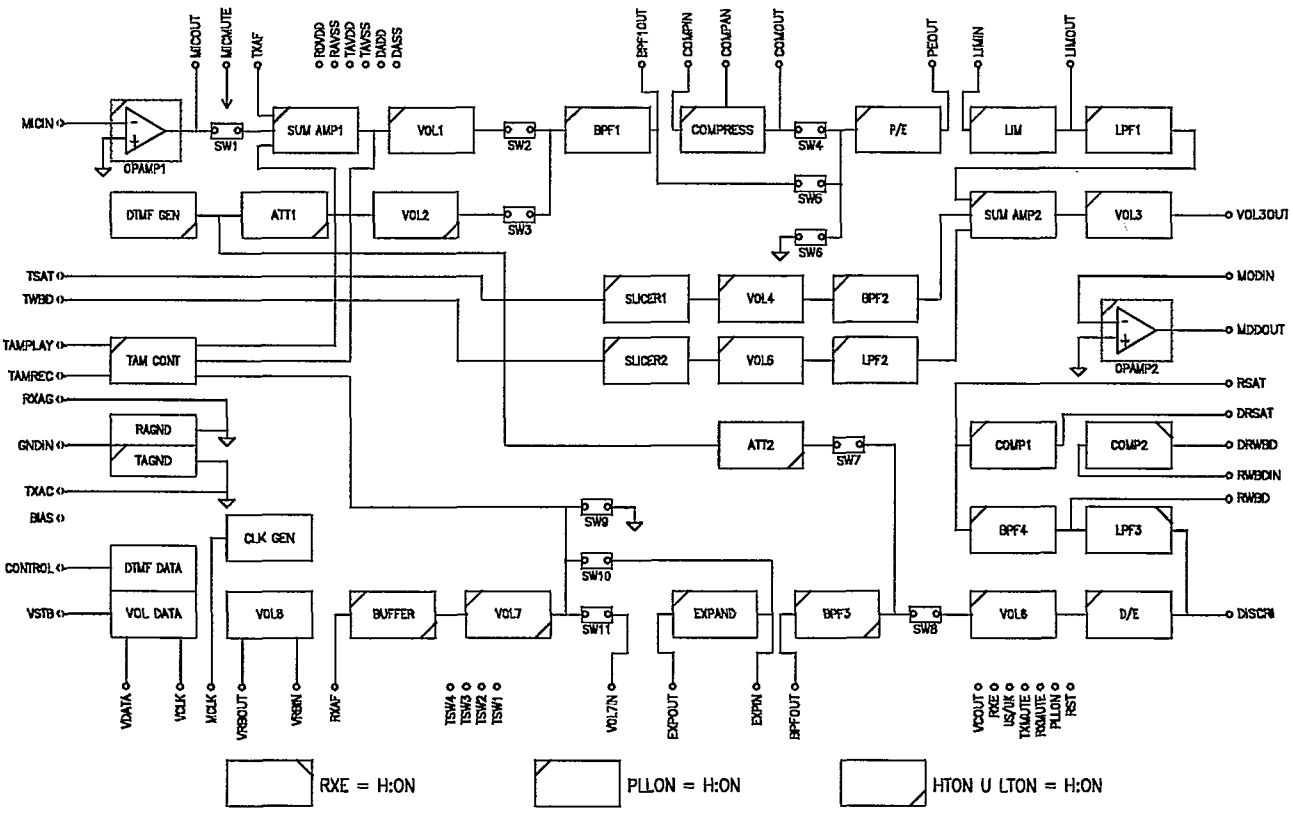


Figure 2.7.5-1: Block diagram of U410

This IC contains a band width limiting filters for transmission and reception audio, amplitude limiting, gain adjustment, compressor, expander, comparison, DTMF signal generation, filters for data transmission and reception and the gain adjustment circuits, pre-emphasis, de-emphasis operational amplifier for inverted amplification, microphone amplifier, adder for the transmission of audio and data, data storage register for gain adjustment, storage register for internal switch setting data, and shift register for setting the internal registers.
Figure 2.7.5-1 shows a Block Diagram of U410.

The Tx AUDIO from microphone audio circuit is fed to U410 Base-band Signal Processing IC. Transmit audio circuit block of U410 consists of band-pass filter (300Hz < F band < 3kHz), pre-emphasis, IDC circuit, and low-pass filter (Fc = 3kHz). Output of U410 is applied to the RF unit MOD terminal.
Besides the audio path, U410 includes a low-pass filter for the transmission of wide-band data.
Wide-band data and the SAT signal are fed from the Cellular System Signal Processing IC (U409) and are summed with the audio signal through the data filter in U410.
The transmit audio signal (voice) is sent with the Tx SAT signal and wide-band data is sent without an audio signal.

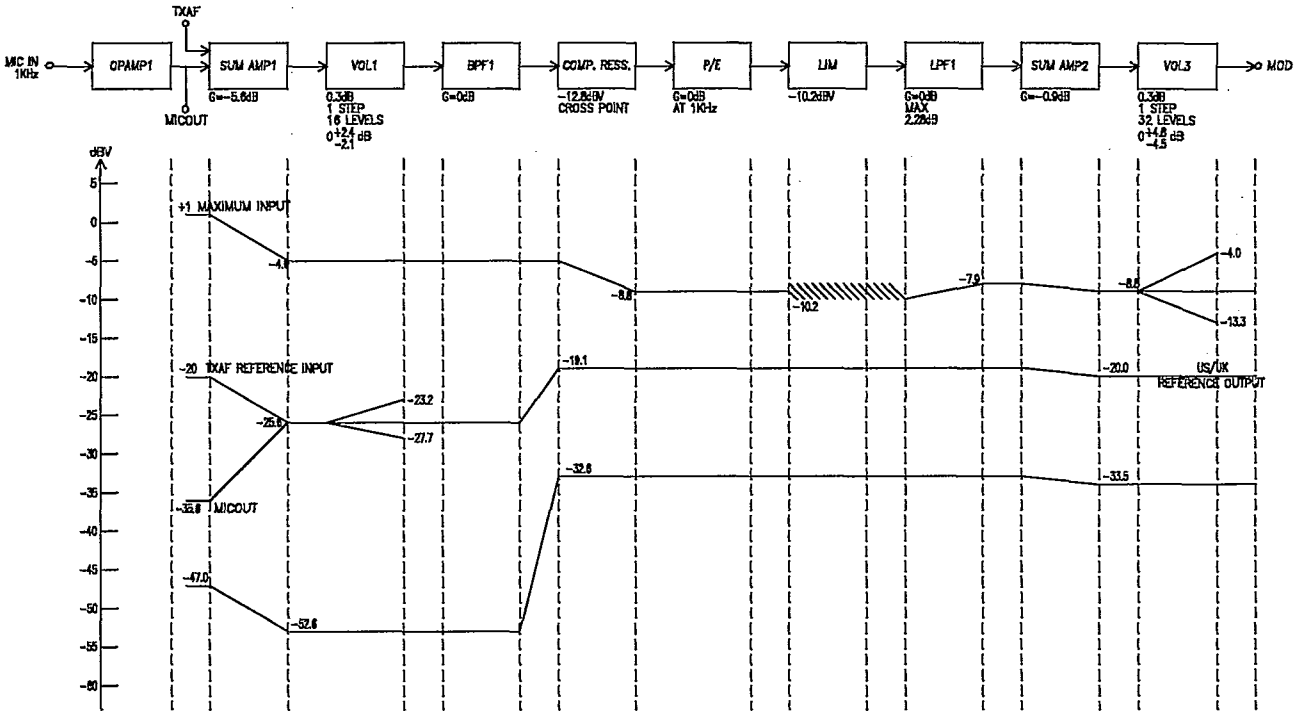


Figure 2.7.5-2: Block and level diagram of transmit circuit

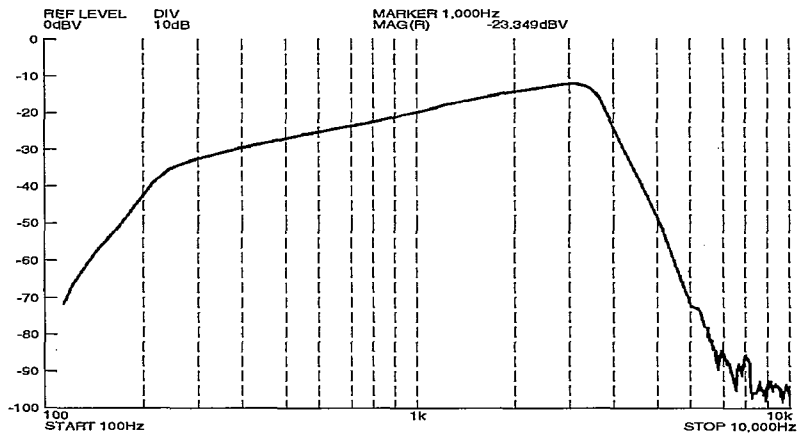


Figure 2.7.5-3: Frequency characteristics of transmit audio

Figure 2.7.5-2 shows the block diagram and level diagram of the Transmit Audio Circuit (U410).
Figure 2.7.5-3 shows the frequency characteristics of the Transmit Audio Circuit.

The DISCRI signal from the RF unit is fed to U410, whose receive audio block consists of de-emphasis circuits, band-pass filter (300Hz < F band < 3kHz), audio-path switching circuits, wide-band data filter (Fc = 20kHz), and SAT band-pass filter (Fc = 6kHz).
Received wide-band data and SAT signal are converted to digital level by comparators and fed to U409.
Figure 2.7.5-4 shows the block diagram and level diagram of the Receive Audio Circuits.
Figure 2.7.5-5 shows the frequency characteristics of the Receive Audio Circuits.

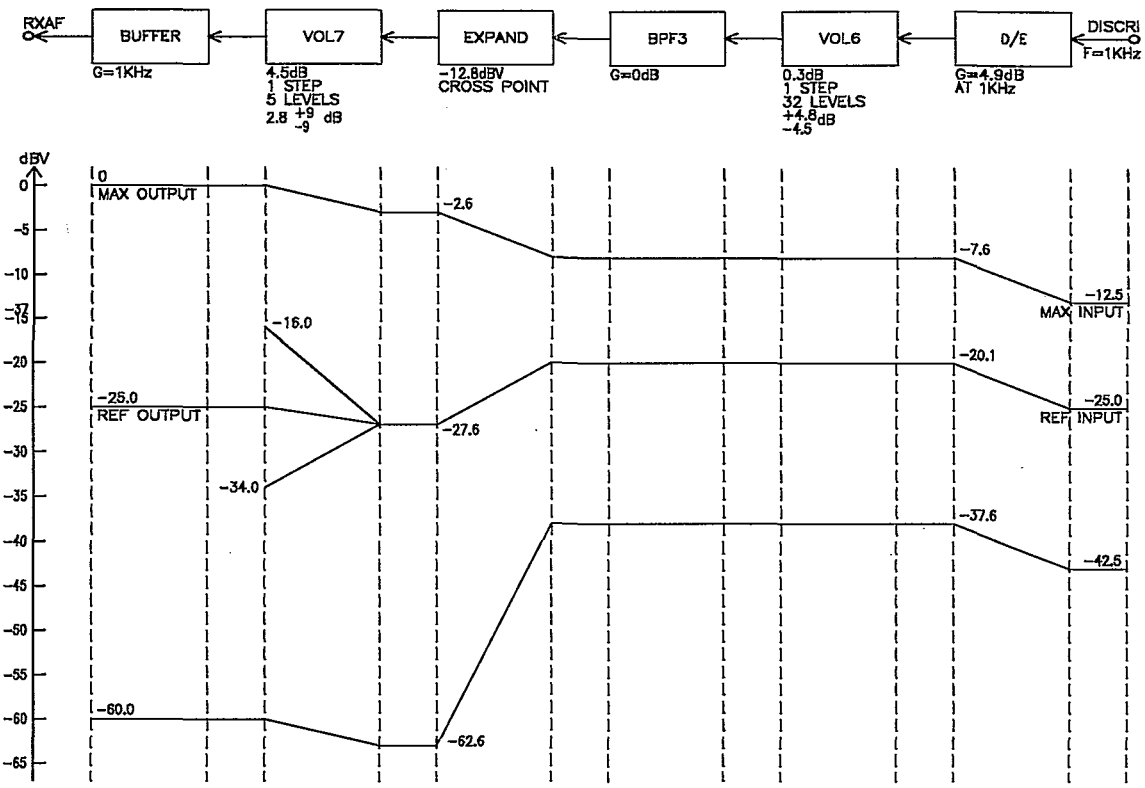


Figure 2.7.5-4: Block and level diagram of receive circuit

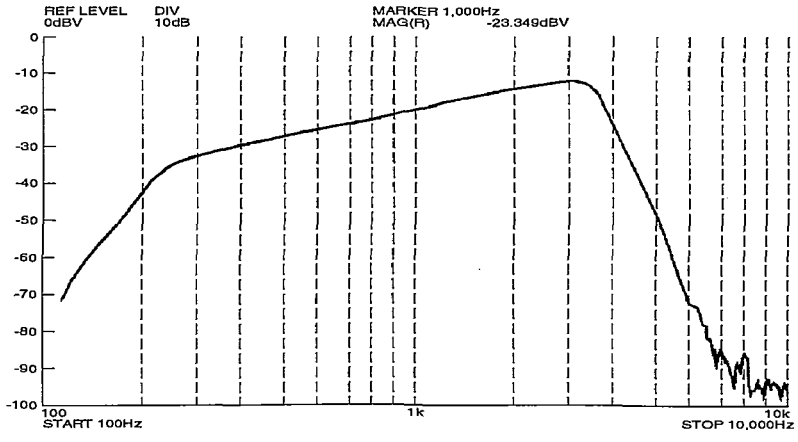


Figure 2.7.5-5: Frequency characteristics of receive audio

2.7.6 LCD Control Circuit

RSSI level, numeric information and status information are displayed on the LCD. The LCD driver is directly controlled by the CPU (U402).
The LCD driver operates in $^1/_6$ bias and $^1/_{32}$ duty mode and has 32 common-signals and 60 segment signals including U402.
Figure 2.7.6-1 shows the block diagram if the LCD Control Circuit.

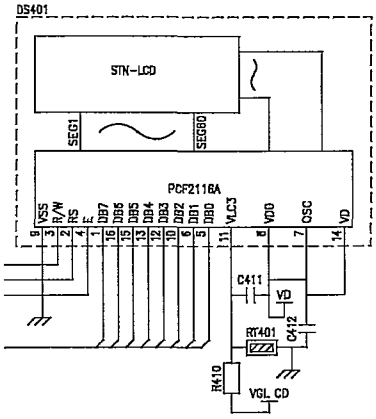


Figure 2.7.6-1: LCD control circuit

2.7.7 Microphone and Earpiece Receiver Audio Circuits

Microphone Audio Circuit

Microphone audio is amplified by the amplifier which is included in U410. The output of U410 is set to -20dBV at -5dB pa (sound pressure level), 1kHz.
A low pass filter is combined with C453 and R461 and High pass filters are combined with C452 and R408, and C251 and R239.
Figure 2.7.7-1 shows the block diagram of the Microphone Audio Circuits.

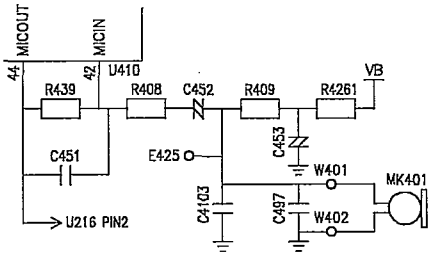


Figure 2.7.7-1: Block diagram of microphone audio circuit

Earpiece Receiver Audio Circuit

The volume is controlled by electric volume circuits included in U410.
Volume level information is sent to U410 via the CPU from the EEPROM.
The attenuator in U410 gives 5 steps of gain reduction for the earpiece receiver. Each step corresponds to 5dB change and is set to the centre of its range at the termination of the call.
Figure 2.7.7-2 shows the block diagram of Earpiece Receiver Audio Circuits.

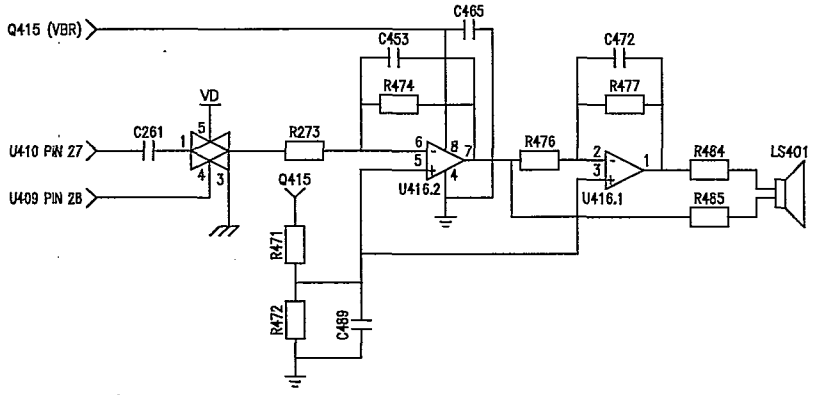


Figure 2.7.7-2: Block diagram of earpiece audio circuit

2.7.8 Buzzer Circuits

The buzzer generates a wake-up tone, ringing tone and low battery alarm tone. The frequency is 2.7kHz and is controlled by U409 GWF Pin 17 which gives 5 steps of gain reduction. Each step corresponds to a 4dB. The buzzer attenuation level is stored in the CPU and is sent to U207.
The buzzer volume level is restricted to level 3 maximum except when ringing and low-battery alarm during conversation is always set to level 1 (minimum) for ear protection.

Volume Level	BUZ VOL			
	VOL3	VOL2	VOL1	VOL0
LEVEL 5	1	0	0	0
LEVEL 4	0	1	0	0
LEVEL 3	0	0	1	0
LEVEL 2	0	0	0	1
LEVEL 1	0	0	0	0

Table 2.7.8-1: Buzzer Volume Control Data

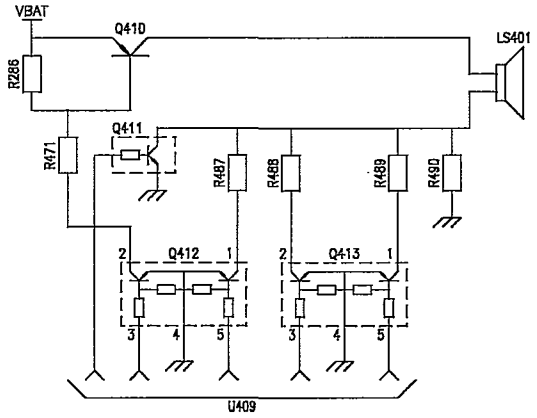
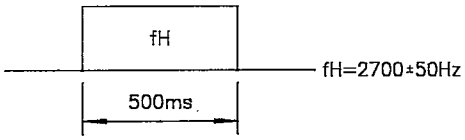


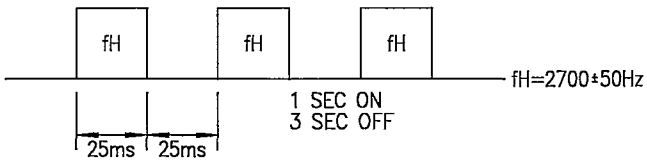
Figure 2.7.8-1: Block diagram of buzzer circuits

2.7.9 Audio Tone

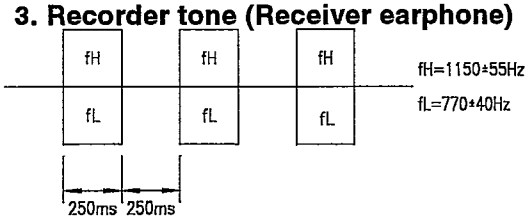
1. Wake-up tone (Buzzer)



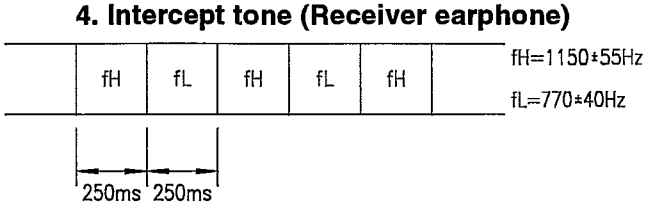
2. Ringing tone (Buzzer)



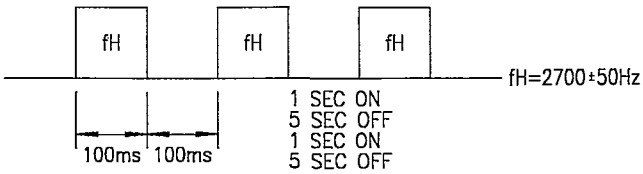
3. Recorder tone (Receiver earphone)



4. Intercept tone (Receiver earphone)



5. Low battery warning tone (Buzzer)



2.7.10 System Power IC and Power Supply Circuit

The system power IC (U413) is used for AMPS/TACS cellular system mobile telephone CMOS System Power IC.
The IC includes the control unit regulators, voltage detector VD1, the RF unit regulators, the DC/DC inverting switching regulators, and the power control logic.
Figure 2.7.10-1 shows the block diagram of U413.

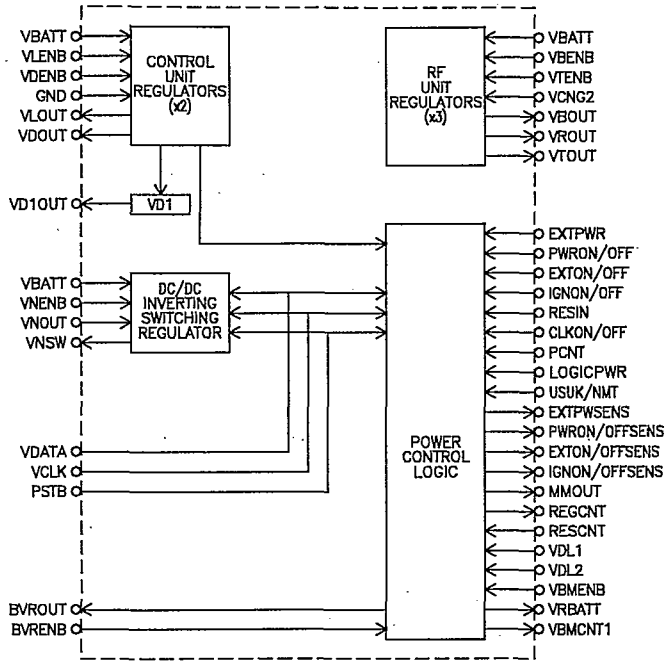


Figure 2.7.10-1: Block diagram of U413

1. **Control unit regulators**
   These regulators include VL and VD (3.7V) regulators for the logic circuits when VLENB and VDENB are active. VD1 is a 3.6V voltage detector.
2. **RF unit regulators block**
   The RF unit these regulators provide VB (3.7V) for U410 and the audio circuit, VR (5.0V) for the receiver circuit and VT (5.0V) for the transceiver circuit when VBENB, VRENB and VTENB are active.
3. ***DC/DC inverting switching regulator***
   This regulator provides the setting voltage for the electronic volume. The electronic volume has 64 steps between -1V and -6V.
4. **Power control logic block**
   This block includes the power control logic circuit and two voltage detectors. The REG CNT output terminal in this block becomes HIGH when either POWER KEY, EXTERNAL ON/OFF, LOGIC POWER signals are active or when the battery is connected momentarily.

Figure 2.7.10-2 shows the circuit diagram of the Power Supply Circuit.

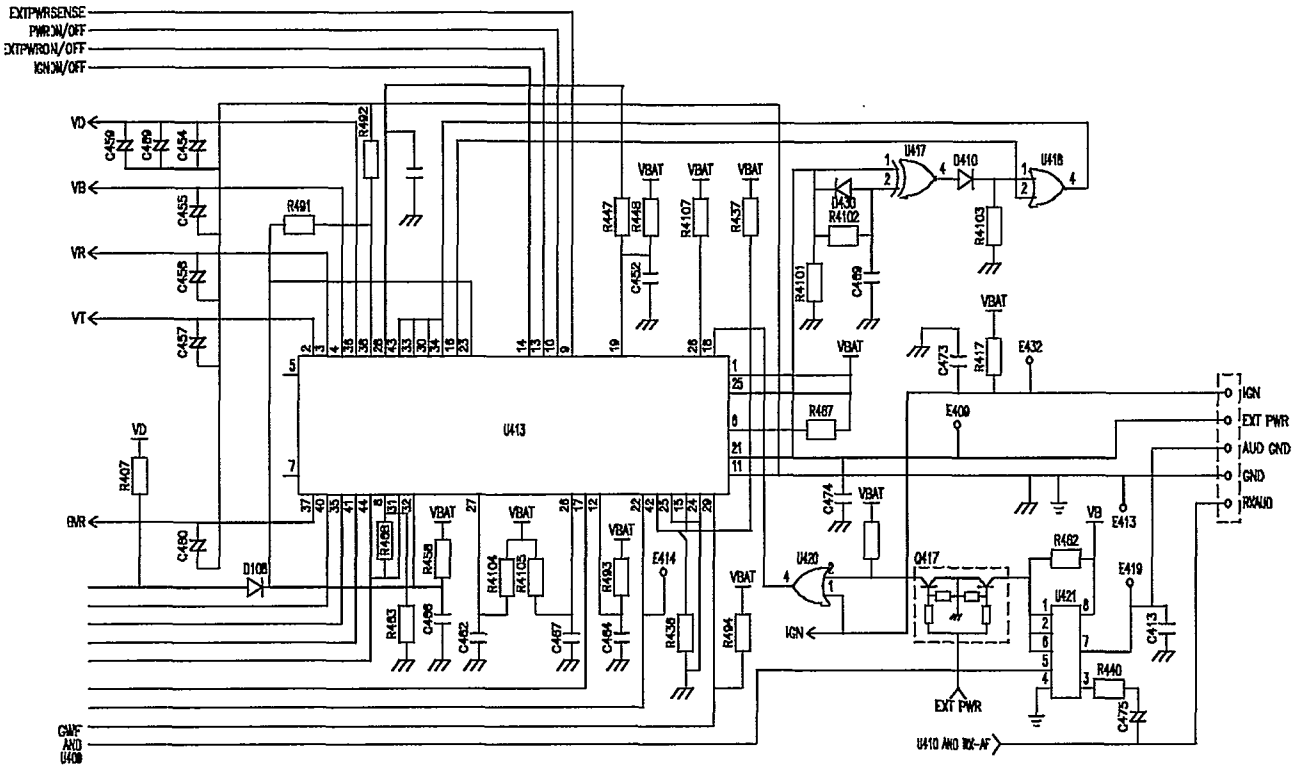


Figure 2.7.10-2 Circuit diagram of power supply circuit

2.7.11 LED Circuit

This circuit consists of CPU U402 and Q402.

When the control signal goes HIGH from CPU pin 72 this is sent to Q402, Q402 is turned on and KEYPAD, BACK-LIGHTS (DS406 to DS411) and LCD BACK-LIGHT are turned on.

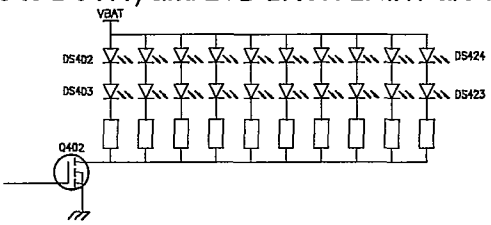


Figure 2.7.11-1: LED circuit

2.7.12 Charge Circuit

This circuit is controlled by the CPU control (U409 and Q405) and FET switch (Q401).

When the HCPV control signal is sent to Q405, the FET switch is turned on and the battery is charged from the EXTPWR supply.

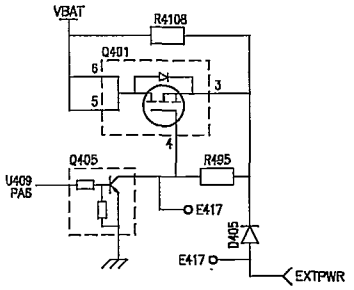


Figure 2.7.12-1: Charge circuit

3 INTERFACE

3.1 Hardware Interface

3.1.1 Control to RF - J402

Pin No	Identification	Description
1	EXT. POWER ON/OFF	Power ON: Ground Power OFF: Open circuit
2	VBAT	To control P101 pin 2 VBAT
3	BAT-ID	The voltage of this pin depends on the type of battery and whether the handheld is on or off. The charger detects the difference in voltage then controls the charging current.
4	VBAT	To control P101 pin 4 VBAT
5	DISCRI	Signal to U410 consists of de-emphasis circuit, band-pass filter, audio-path switching, wide band data filter and SAT band-pass filter.
6	GND	Ground
7	AFC CONT.	AFC control
8	VG	To control P101 pin 8 VG
9	VRx	To control P101 pin 9 VRx
10	SERIAL (F)	Output data to external equipment.
11	RGC	Power saving control signal. Changes front end block bias.
12	SERIAL (R)	Input data form external equipment.
13	PSC	Power saving control circuit. Interval receiving.
14	PL SEL	To control P101 pin 14 PL SEL
15	RSSI	Receiver signal detector.
16	VDET	To control P101 pin 16 VDET
17	Rx LD	To control P101 pin 17 Rx LD
18	CARR ON/OFF	Tx ON/OFF control signal Tx ON: Ground Tx OFF: Open collector
19	CLOCK	Clock
20	VAPC	Automatic power control
21	DATA	Data signal
22	Tx LD	To control P101 pin 22 Tx LD
23	BAT-TEMP	Battery temperature monitor
24	VTx	To control P101 pin 24 VTx
25	GND	Ground
26	STB	To control P101 pin 26 STB

Pin No	Identification	Description
27	VPA	To control P101 pin 27 VPA
28	VF	To control P101 pin 28 VF
29	VPA	To control P101 pin 29 VPA
30	MOD	Tx modulator signal

3.1.2 Control to Handsfree - P401

Pin No	Identification	Description
1	EXT. PWR	Power ON: Power OFF:
2	Rx AUD	Rx Audio Nominal level DEV Impedance
3	IGN	Ignition sense ON/OFF ON: OFF:
4	Tx AUD	Tx Audio Nominal level DEV Impedance
5	AUD GND	Audio ground for headset adaptor only
6	GND	Ground

3.1.3 RF to Control - P101

Pin No	Identification	Description
1	EXTPOW ON/OFF	Power ON: Ground Power OFF: Open circuit
2	VBAT	To control J402 pin 2 VBAT
3	BAT ID	The voltage of this pin depends on the type of battery and whether the handheld is on or off. The charger detects the difference in voltage then controls the charging current.
4	VBAT	To control J402 pin 4 VBAT
5	DISCRI	Signal to U410 consists of de-emphasis circuit, band-pass filter, audio path switching, wide band data filter, and SAT band-pass filter.
6	GND	Ground
7	AFC CONT.	AFC control
8	VG(-1.4V)	To control J402 pin 8 VG
9	VRx(+3.7V)	To control J402 pin 9 VRx
10	SERIAL (F)	Output data to external equipment
11	RGC	Power saving control signal. Change front end block bias.
12	SERIAL (R)	Input data from external equipment

Pin No	Identification	Description
13	Rx PSC	Power saving control circuit. Interval receiving.
14	PL SEL	To control J402 pin 14 Rx PSC
15	RSSI	Receiver signal detector
16	VDET	To control J402 pin 16 VDET
17	Rx LD	To control J402 pin 17 Rx LD
18	CARR ON/OFF	Tx ON/OFF control signal Tx ON: Ground Tx OFF: Open collector
19	CLK	Clock
20	VAPC	Automatic power control
21	DATA	Data signals
22	Tx LD	To control J402 pin 22 TxLD
23	BAT-TEMP	Battery temperature monitor
24	VTx(+3.7V)	To control J402 pin 24 VTx
25	GND	Ground
26	STB	To control J402 pin 26 STB
27	VPA(+7.0V)	To control J402 pin 27 VPA
28	VF	To control J402 pin 28 VF
29	VPA(+7.0V)	To control J402 pin 29 VPA
30	MOD	Tx modulator signal

3.1.4 Handsfree to telephone (Control) - P301

Pin No	Identification	Description
1	TxAUD	Tx Audio Nominal level DEV Impedance
2	IGN	Ignition sense ON/OFF ON: OFF:
3	RxAUD	Rx Audio Nominal level DEV Impedance
4	EXT. PWR	Power ON: Power OFF:
5	AUD GND	Not connected
6	GND	Ground

3.1.5 Handsfree to power supply - J303

Pin No	Identification	Description
1	CAR POWER	External power from car battery (+) VCC =
2	IGNITION	Ignition ON/OFF ON: OFF:
3	GND	Power supply ground (-)

3.2 Test Points

3.2.1 Control

Pin No	Identification
E401	VG - J402
E402	RSSI - J402
E403	Rx LD - J402
E404	Tx LD - J402
E405	CLOCK - J402
E406	DATA - J402
E407	STB - J402
E408	VDET - J402
E409	VAPC - J402
E410	PL SEL - J402
E411	CARR ON/OFF - J402
E412	MOD - J402
E413	DISCRI - J402
E414	U413 LOGIC PWR,U402 P
E415	PSC - J402
E416	RGC - J402
E417	Q401 PIN 4
E418	BAT-ID - J402
E419	AUD GND
E420	BAT-REMP - J402
E421	VPA - J402
E422	VRx - J402
E423	VBAT - J402

Pin No	Identification
E401	VG - J402
E402	RSSI - J402
E424	U413 PWR ON/OFF VIA R4
E425	MICROPHONE IN
E426	AF CCONT - J402
E427	EXT. POWER ON/OFF - J402
E428	SERIAL (F) - J402
E429	SERIAL (R) - J402
E430	Tx AUD - P401
E431	Rx AUD - P401
E432	IGN
E433	EXTPWR
E434	GND
E435	LS401
E436	LS401
E437	RESOUT U409
E438	KEYPAD MATRIX P(80)
E439	KEYPAD MATRIX P(81)
E440	KEYPAD MATRIX P(82)
E441	VF - J402
E442	VTx - J402

3.2.2 RF

Pin No	Identification
TP1	EXTPOW ON/OFF P101
TP2	SERIAL (F)
TP3	SERIAL (R)
TP4	VBAT
TP102	RGC
TP3101	DISCRI

3.2.3 Handsfree

Pin No	Identification
E300	CAR POWER J303
E301	IGNITION J303
E302	GND J303
E303	U311 OUT
E304	U308 IN
E305	U309 OUT
E306	U307 PIN 3
E307	U308 OUT
E311	TxAUD P301
E312	IGN P301
E313	RxAUD P301
E314	EXT. PWR P301
E315	AUD GND P301
E316	GND P301
E317	J302
E318	U304 PIN 1
E319	LS301
E320	LS301

3.3 Serial Interface

Data is transmitted and received via a full duplex asynchronous transmission at 9,600bit/second between the micro controller in the hand portable unit and peripheral devices using the serial interface.

3.3.1 Data format

Frame format
Each frame consists of 11 bits. Both downward serial data (main CPU to peripheral device) and upward serial data (peripheral device to main CPU) are transmitted using the same format.

ST: Start Mark (= 0)
DATA: Data is sent from LSB (Least Significant Bit) first.
P: Parity (Even Parity)
SP: Stop Mark (=1)

Command format
Commands consists of multiple frames; 4 frames minimum, 258 frames. The DATA part of each frame in a command is defined as follows:

The Data Length shall take the value of 1 to 255 inclusive.

NOTE: The interval between any two consecutive frames in a command must be such that the transmission of the ST mark of a frame must be started within 5ms of the start of the transmission of ST mark of the previous frame.

3.3.2 Data transmission protocol

The handshake process is not generally required so that both the main CPU and peripheral devices can transmit their commands at any time. The exceptions to this rule are:
The peripheral device must not transmit any command for a period of 50 ms after a POLLING command is received.
Some peripheral devices are required to use a different handshake procedure in order to transmit a command.
The peripheral device shall transmit the TRANSMISSION REQUEST command to the main CPU.
If the TRANSMISSION REQUEST ACKNOWLEDGEMENT command is received from the main CPU, the peripheral device must start the transmission of a command within 50 ms and finish the transmission within 350 ms of receipt of transmission request acknowledgement.
The peripheral device can transmit only one command during this period.
If the TRANSMISSION REQUEST ACKNOWLEDGEMENT command is not received from the main CPU within 350 ms, the peripheral device can transmit a TRANSMISSION REQUEST command to the main CPU again. However it must be within 400 ms of the previous transmission of TRANSMISSION REQUEST.

NOTES:

1. If the peripheral device receives a POLLING command whilst it is transmitting a command, it will transmit the latter frames of the command.
2. Peripheral devices whose transmitting command consists of only four frames, and the test set, are not required to use the handshake process.

3.3.3 Operation Process

3.3.3.1 Serial interface initialisation.

The main CPU transmits the INITIALISATION command, and then receives the INITIALISATION ACKNOWLEDGEMENT command, from each peripheral device. It can therefore determine whether or not a peripheral device is connected. The main CPU performs this initialisation process as follows:
The main CPU transmits the INITIALISATION command to the handsfree cradle. The handsfree CPU transmits the INITIALISATION ACKNOWLEDGEMENT command, finishing the transmission within 20 ms of receiving the fourth frame of the INITIALISATION command.
The handsfree CPU uses the INITIALISATION ACKNOWLEDGEMENT command to inform the main CPU whether the power booster is connected or not.
If necessary, the main CPU transmits the INITIALISATION command to the other peripheral devices, which also transmit the INITIALISATION ACKNOWLEDGEMENT command, finishing the transmission within 20 ms of receiving the fourth frame of the INITIALISATION command.

NOTE: The peripheral device must not transmit any command, other than the INITIALISATION ACKNOWLEDGEMENT command, for 500 ms after it receives the INITIALISATION command from the main CPU. The peripheral device which does not expect to receive an INITIALISATION command must not transmit any command for 2 seconds after power on unless it receives a command from the main CPU.

3.3.3.2 Normal Process

Following serial interface initialisation, the following processes are executed by the CPUs.

Main CPU process:
The main CPU generates its own timing for transmitting a command on the downward serial interface. When the main CPU transmits the TRANSMISSION REQUEST ACKNOWLEDGEMENT command to the peripheral device, it sets a 400ms timer.

The handsfree cradle process:
The handsfree cradle does not transmit any command except the INITIALISATION ACKNOWLEDGEMENT command.

The test set process:
The test set generates its own timing for transmitting a command.

3.3.3.3 Error process

Two types of error may occur on the serial interface, the parity error and the framing error. If either of these errors are detected, the receiving side of the serial interface will lose the data frames already received. It must then wait for another Start Byte frame.
If a command is received correctly, but is unrecognisable, it will be ignored.

3.3.3.4 Command synchronisation

The transmitting side of the serial interface generates its own timing for transmitting a command.
The receiving side of the serial interface will synchronise as follows:

1. If the 00H data is received when no command is being received, it should be recognised as the Start Byte frame and the command synchronisation is acquired. Otherwise, the data frame will be ignored.
2. If the data, except 00H data, is received within 5 ms of the Start Byte frame, it will be recognised as the Command ID frame. Otherwise, the command synchronisation will be lost and another Start Byte frame should be expected.
3. If the data, except 00H data, is received within 5ms after the Command ID frame it will be recognised as the Data Length frame. Otherwise, the command synchronisation will be lost.
4. If no data is received within 5 ms of the command synchronisation, the command synchronisation will be lost.

3.3.4 Serial command list

Upward serial command

Start Byte (=00H)	1st frame
Command ID	2nd frame
Data length (=1)	3rd frame
Data 1 (=Transaction code)	4th frame

The upward serial command usually consists of four frames. But some of the option devices or the test sets transmit the command which consists of five frames or longer in order to transmit the addition data bytes following the transaction code.
The command IDs of the upward serial commands are shown below and the upward serial commands are listed in 3.3.5.1.

Type	Code	Command ID	Frame Length	Transmitter	Remarks
01H to 04H Handset Command	01H	POLLING RESPONSE	4	Handset	
	02H	HANDSET	4	Handset	INITIALISATION ACKNOWLEDGEMENT and Key/Hook
	04H	Reserved	4	—	
08H Car adapter command	08H	CAR ADAPTER	4	Car adapter	
30H to 7FH Option command	30H	USER OPTION	4	User's option units	Not manufactured by Panasonic
	40H	LOCAL CONTROL	6	Local control adapter	only for KU
80H to F0H Test command	80H	TEST SET	4 or longer	Test set	

Note: The TRANSMISSION REQUEST command is defined the transaction code in Data 1.

Downward serial command

The command IDs of the downward serial command are shown below.

Code	Command ID	Receiver	Remarks
00H	Not used		
01H	HANDSET CONTROL (Note 1)	Handset	Mobile model only
02H	AUDIO PATH AND LC CONTROL	Handset	Mobile model only
04H	DISPLAY CONTROL	Handset	Mobile model only
03H 05H to 07H	Reserved	Handset	Mobile model only
08H	Reserved	Car adapter	Handheld model only
09H to 0FH	Reserved	Reserved	
22H to 2FH	Reserved	Option units	
30H	USER OPTION CONTROL	User's option unit	Not manufactured by Panasonic
40H	LOCAL CONTROL DATA	Local control adapter	only for UK
80H	TEST DATA	Test set	

All other codes are reserved.

Note 1: The POLLING, the HS TRANSMISSION INHIBIT, or the HS TRANSMISSION PERMIT etc.
Note 2: The TRANSMISSION REQUEST ACKNOWLEDGEMENT command is defined by the fourth frame.

The downward serial command is constructed in either of the followings format.

(except the DISPLAY CONTROL command)

Start Byte (=00H)	1st frame
Command ID	2nd frame
Data Length	3rd frame
Data 1 (Transaction Code)	4th frame
Data 2	5th frame
....	Parameter data for the transaction code (N+3)th frame
Data N	

(the DISPLAY CONTROL command)

Start Byte (=00H)	1st frame
Command ID	2nd frame
Data Length	3rd frame
Data 1	4th frame
Data 2	5th frame
....	Data set of single or double bytes. (NOTE) (N+3)th frame
Data N	

Note: As for the Data portion, the display control order consists of the two bytes; the former is the display control directive byte and the latter is the display control byte. The display data order consists of just a display data byte.
The display control orders and the display data orders can be packed in the Data portion of a DISPLAY CONTROL command up to 160 bytes.
The downward serial commands are listed in 3.3.5.2.

3.3.5 Serial command list

3.3.5.1 Upward serial command (Peripheral device to main CPU) 1 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
02H HANDSET	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F	1	INITIALISATION ACKNOWLEDGEMENT	

Upward serial command (Peripheral device to main CPU) 2 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
02H HANDSET	20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F			

Upward serial command (Peripheral device to main CPU) 3 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
02H HANDSET	40	1	.	key in	
	41		A	key in	
	42		B	key in	
	43		C	key in	
	44		D	key in	
	45		E	key in	
	46		F	key in	
	47		G	key in	
	48		H	key in	
	49		I	key in	
	4A		J	key in	
	4B		K	key in	
	4C		L	key in	
	4D		M	key in	
	4E		N	key in	
	4F		O	key in	
	50	1	P	key in	
	51		Q	key in	
	52		R	key in	
	53		S	key in	
	54		T	key in	
	55		U	key in	
	56		V	key in	
	57		W	key in	
	58		X	key in	
	59		Y	key in	
	5A		Z	key in	
	5B		,	key in	
	5C				
	5D				
	5E				
	5F				

Upward serial command (Peripheral device to main CPU) 4 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
02H HANDSET	60				
	61	1	1	key off	
	62		2	key off	
	63		3	key off	
	64		4	key off	
	65		5	key off	
	66		6	key off	
	67		7	key off	
	68		8	key off	
	69		9	key off	
	6A		0	key off	
	6B		*	key off	
	6C		#	key off	
	6D				
	6E				
	6F				
	70	1			
	71		+	key off	
	72		-	key off	
	73		MUTE	key off	
	74		SND	key off	
	75		CLR	key off	
	76		END	key off	
	77		RCL	key off	
	78		STO	key off	
	79		FCN	key off	
	7A		ALP	key off	
	7B		PAUSE	key off	
	7C		PREFIX	key off	
	7D		CAPS	key off	
	7E		INS	key off	
	7F		WIDE	key off	

Upward serial command (Peripheral device to main CPU) 5 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
02H HANDSET	80	1	. key off	
	81		A key off	
	82		B key off	
	83		C key off	
	84		D key off	
	85		E key off	
	86		F key off	
	87		G key off	
	88		H key off	
	89		I key off	
	8A		J key off	
	8B		K key off	
	8C		L key off	
	8D		M key off	
	8E		N key off	
	8F		O key off	
	90	1	P key off	
	91		Q key off	
	92		R key off	
	93		S key off	
	94		T key off	
	95		U key off	
	96		V key off	
	97		W key off	
	98		X key off	
	99		Y key off	
	9A		Z key off	
	9B		, key off	
	9C			
	9D			
	9E			
	9F			

Upward serial command (Peripheral device to main CPU) 6 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
08H CAR ADAPTER	00	2	INITIALISATION ACKNOWLEDGEMENT	(Note)
	01			
	02			
	03			
	04			
	05			
	06			
	07			
	08			
	09			
	0A			
	0B			
	0C			
	0D			
	0E			
	0F			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			
	1A			
	1B			
	1C			
	1D			
	1E			
	1F			

Note: The second data byte of the INITIALISATION ACKNOWLEDGEMENT command indicates whether or not the handsfree and the power booster and DTMF Receiver Unit are connected.

Upward serial command (Peripheral device to main CPU) 7 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
08H CAR ADAPTER	20	1	1	key	
	21		2	key	
	22		3	key	
	23		4	key	
	24		5	key	
	25		6	key	
	26		7	key	
	27		8	key	
	28		9	key	
	29		0	key	
	2A		*	key	
	2B		#	key	
	2C				
	2D				
	2E				
	2F				
	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	3A				
	3B				
	3C				
	3D				
	3E				
	3F				

Upward serial command (Peripheral device to main CPU) 8 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
30H USER OPTION	20	1	1	key in	
	21		2	key in	
	22		3	key in	
	23		4	key in	
	24		5	key in	
	25		6	key in	
	26		7	key in	
	27		8	key in	
	28		9	key in	
	29		0	key in	
	2A		*	key in	
	2B		#	key in	
	2C				
	2D				
	2E				
	2F				
	30	1	+	key in	
	31		-	key in	
	32		MUTE	key in	
	34		SND	key in	(Note)
	35		CLR	key in	
	36		END	key in	(Note)
	37		RCL	key in	
	38		STO	key in	
	39		FCN	key in	
	3A		ALPH	key in	
	3B		PAUSE	key in	
	3C		PREFIX	key in	
	3D		CAPS	key in	
	3E		INS	key in	
	3F		WIDE	key in	

Note: The user's option units transmit the SND/END command instead of the OFF-HOOK/ON-HOOK command.

Upward serial command (Peripheral device to main CPU) 9 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
30H USER OPTION	40	1	.	key in	
	41		A	key in	
	42		B	key in	
	43		C	key in	
	44		D	key in	
	45		E	key in	
	46		F	key in	
	47		G	key in	
	48		H	key in	
	49		I	key in	
	4A		J	key in	
	4B		K	key in	
	4C		L	key in	
	4D		M	key in	
	4E		N	key in	
	4F		O	key in	
	50	1	P	key in	
	51		Q	key in	
	52		R	key in	
	53		S	key in	
	54		T	key in	
	55		U	key in	
	56		V	key in	
	57		W	key in	
	58		X	key in	
	59		Y	key in	
	5A		Z	key in	
	5B		,	key in	
	5C				
	5D				
	5E				
	5F				

Upward serial command (Peripheral device to main CPU) 10 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
30H USER OPTION	60				
	61	1	1	key off	
	62		2	key off	
	63		3	key off	
	64		4	key off	
	65		5	key off	
	66		6	key off	
	67		7	key off	
	68		8	key off	
	69		9	key off	
	6A		0	key off	
	6B		*	key off	
	6C		#	key off	
	6D				
	6E				
	6F				
	70				
	71	1	+	key off	
	72		-	key off	
	73		MUTE	key off	
	74		SND	key off	
	75		CLR	key off	
	76		END	key off	
	77		RCL	key off	
	78		STO	key off	
	79		FCN	key off	
	7A		ALPH	key off	
	7B		PAUSE	key off	
	7C		PREFIX	key off	
	7D		CAPS	key off	
	7E		INS	key off	
	7F		WIDE	key off	

Upward serial command (Peripheral device to main CPU) 11 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
30H USER OPTION	80	1	. key off	
	81		A key off	
	82		B key off	
	83		C key off	
	84		D key off	
	85		E key off	
	86		F key off	
	87		G key off	
	88		H key off	
	89		I key off	
	8A		J key off	
	8B		K key off	
	8C		L key off	
	8D		M key off	
	8E		N key off	
	8F		O key off	
	90	1	P key off	
	91		Q key off	
	92		R key off	
	93		S key off	
	94		T key off	
	95		U key off	
	96		V key off	
	97		W key off	
	98		X key off	
	99		Y key off	
	9A		Z key off	
	9B		, key off	
	9C			
	9D			
	9E			
	9F			

Upward serial command (Peripheral device to main CPU) 12 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
40H LOCAL CONTROL	00			
	01			
	02	1	TRANSMISSION REQUEST	
	03			
	04			
	05			
	06			
	07			
	08			
	09			
	0A			
	0B			
	0C			
	0D			
	0E			
	0F			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			
	1A			
	1B			
	1C			
	1D			
	1E			
	1F			

Upward serial command (Peripheral device to main CPU) 13 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
40H LOCAL CONTROL	20	3	ORDER RESPONSE	(Note 1)
	21			
	22			
	23			
	24	3	NEW ORDER W/O SERIAL NUMBER	(Note 2)
	25	3	NEW ORDER W/ SERIAL NUMBER	(Note 2)
	26	3	ORDER RESPONSE W/O SERIAL NUMBER	(Note 3)
	27	3	ORDER RESPONSE W/ SERIAL NUMBER	(Note 3)
	28			
	29			
	2A			
	2B			
	2C			
	2D			
	2E			
	2F			
	30			
	31			
	32			
	33			
	34			
	35			
	36			
	37			
	38			
	39			
	3A			
	3B			
	3C			
	3D			
	3E			
	3F			

Note 1: The equipment transmits the local control order confirmation message to the land station if this command is received on a voice channel.
Note 2: The equipment transmits the page response message to the land station if this command is received on a control channel.
Note 3: The equipment transmits the local control order confirmation message to the land station if this command is received on a control channel.

Upward serial command (Peripheral device to main CPU) 14 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H	20			
TEST SET	21	1	IDINFO	
(mode	22	1	TEST (SUSPEND)	
selection	23			
commands)	24	1	ADJUST	
	25			
	26			
	27			
	28	1	NORMAL (MONITOR)	
	29			
	2A			
	2B			
	2C			
	2D			
	2E			
	2F			
	30			
	31			
	32			
	33			
	34			
	35			
	36			
	37			
	38			
	39			
	3A			
	3B			
	3C			
	3D			
	3E			
	3F			

Upward serial command (Peripheral device to main CPU) 15 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H	40			
TEST SET	41	1	INAM 1	
(ID information	42	1	RNAM 1	
access mode	43			
commands)	44	33	WNAM 1	
	45			
	46			
	47			
	48			
	49			
	4A			
	4B	1	INAM 2	
	4C	1	RNAM2	
	4D			
	4E	33	WNAM 2	
	4F			
	50			
	51			
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	5A			
	5B			
	5C			
	5D			
	5E			
	5F			

Upward serial command (Peripheral device to main CPU) 16 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H	60			
TEST SET	61	1	INIT	
(Test mode	62	2	CARRIER ON/OFF	
commands)	63	3	LOAD SYNTH	
	64	2	SET ATTN.	
	65	2	Rx MUTE/UNMUTE	
	66	2	Tx MUTE/UNMUTE	
	67	2	ST ON/OFF	
	68	1	SET-UP	
	69	1	VOICE	
	6A			
	6B			
	6C	1	MON IN	
	6D	2	MON OUT	
	6E	1	RNVM	
	6F	N+1	WNVM	(Note)
	70	1	INVM	
	71	1	SEND-SN	
	72	2	SAT ON/OFF	
	73	2	DTMF ON	
	74	1	DTMF OFF	
	75	2	ST-DTMF	
	76	1	MES-RSSI	
	77	1	ZERO-CDATA	
	78	2	COMP ON/OFF	
	79	1	VERSION	
	7A	1	SEND-NAM 1	
	7B	1	SEND-NAM 2	
	7C			
	7D			
	7E			
	7F	1	TURNAROUND	

Upward serial command (Peripheral device to main CPU) 17 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H	80	1	STATUS	
TEST SET	81	1	MON-ERCODE	
(Test mode	82	1	CLEAR-ERCODE	
commands)	83	2	MIC ON/OFF	
	84	1	ICAS	
	85	2	BACKLIGHT ON/OFF	
	86	2	BUZZER ON/OFF	
	87	2	RGC ON/OFF	
	88			
	89			
	8A	2	VOLUME	
	8B	1	RWATCH	
	8C	7	WWATCH	
	8D	1	HEATRUN	
	8E	17	CHK-MEM	
	8F			
	90			
	91			
	92			
	93			
	94			
	95			
	96			
	97			
	98			
	99			
	9A			
	9B			
	9C			
	9D			
	9E			
	9F			

Upward serial command (Peripheral device to main CPU) 18 of 18

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H	A0			
TEST SET	A1	4	SET-PL	
(Adjustment	A2	4	SET-MDEV	
mode	A3	4	SET-SDEV	
commands)	A4	4	SET-WBD	
	A5	4	SET-SAT	
	A6	4	SET-DTMF	
	A7	3	SET-RxAUDIO	
	A8	1	SET-VREF	
	A9			
	AA			
	AB			
	AC			
	AD			
	AE			
	AF			
	B0	1	REVR	
	B1	2	AEVR	
	B2	1	WEVR	
	B3			
	B4	1	EXIT	
	B5			
	B6			
	B7			
	B8	26	IEVR	
	B9			
	BA			
	BB			
	BC			
	BC			
	BD			
	BE			
	BF			

3.3.5.2 Downward serial command (Main CPU to peripheral device) 1 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
01H HANDSET CONTROL	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F	 1 1 1 1	 INITIALISATION POLLING HS TRANSMISSION INHIBIT HS TRANSMISSION PERMIT	

Downward serial command (Main CPU to peripheral device) 2 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
02H AUDIO PATH AND LC CONTROL	20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	HANDS-FREE SPEAKER RECEIVER HANDSET 1 HANDSET 2 	(VOLUME LEVEL 1) (VOLUME LEVEL 2) (VOLUME LEVEL 3) (VOLUME LEVEL 4) (VOLUME LEVEL 5) (VOLUME LEVEL 1) (VOLUME LEVEL 2) (VOLUME LEVEL 3) (VOLUME LEVEL 4) (VOLUME LEVEL 5) (VOLUME LEVEL 1) (VOLUME LEVEL 2) (VOLUME LEVEL 3) (VOLUME LEVEL 4) (VOLUME LEVEL 5) (VOLUME LEVEL 1) (VOLUME LEVEL 2) (VOLUME LEVEL 3) (VOLUME LEVEL 4) (VOLUME LEVEL 5)	

Downward serial command (Main CPU to peripheral device) 3 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
02H AUDIO PATH AND LC CONTROL	40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F	1 1 1	BACK LIGHT ON BACK LIGHT OFF BACK LIGHT BLINK	

Downward serial command (Main CPU to peripheral device) 4 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F	1	DISPLAY CONTROL DIRECTIVE EXTENDED CHARACTER DEFINITION 1 EXTENDED CHARACTER DEFINITION 2	(Note 1) (Note 2) (Note 2)
	10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F	0	. (Full stop) , (Comma) ' (Single quotation) " (Double quotation) : (Colon) ; (Semicolon) ? ! _ (Underscore) + - < > / \ [	

Note: The code 09H is reserved for another DISPLAY CONTROL DIRECTIVE and 0CH to 0FH for other EXTENDED CHARACTER DEFINITION

Note 1: An additional data is added as a display control data byte.

Note 2: The codes for the RING display (mid. size and large size) for the non-English languages are assigned.

Downward serial command (Main CPU to peripheral device) 5 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	20	0	NULL (Space)	
	21		]	
	22		{	
	23		}	
	24		(	
	25		)	
	26		←	
	27		→	
	28		$	
	29		£	
	2A		÷	
	2B		¥	
	2C		=	
	2D		%	
	2E		&	
	2F		^	
	30	0	0	
	31		1	
	32		2	
	33		3	
	34		4	
	35		5	
	36		6	
	37		7	
	38		8	
	39		9	
	3A			
	3B		*	
	3C		#	
	3D			
	3E		.	
	3F		.	

Downward serial command (Main CPU to peripheral device) 6 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	40	0	i	
	41		A	
	42		B	
	43		C	
	44		D	
	45		E	
	46		F	
	47		G	
	48		H	
	49		I	
	4A		J	
	4B		K	
	4C		L	
	4D		M	
	4E		N	
	4F		O	
	50	0	P	
	51		Q	
	52		R	
	53		S	
	54		T	
	55		U	
	56		V	
	57		W	
	58		X	
	59		Y	
	5A		Z	
	5B			
	5C			
	5D			
	5E			
	5F			

Downward serial command (Main CPU to peripheral device) 7 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F	0	¿ a b c d e f g h i j k l m n o	
	70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F	0	p q r s t u v w x y z	

Downward serial command (Main CPU to peripheral device) 8 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	80 81 82 83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F	0	Á À Â Ä Ã Å Æ É È Ê Ë Í Ì Î Ï Ó	
	90 91 92 93 94 95 96 97 98 99 9A 9B 9C 9D 9E 9F		Ò Ô Ö Ø Œ Ú Ù Û Ü Ç Ñ N° ß >> <<	

Downward serial command (Main CPU to peripheral device) 9 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF	0	à á â ä ã å æ é è ê ë í ì î ï ó	
	B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 BA BB BC BD BE BF	0	ò ô ö ø œ ú ù û ü ç ñ n° ß (Lower case)	

Downward serial command (Main CPU to peripheral device) 10 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL (Reserved)	C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF	0		
	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF	0		

Downward serial command (Main CPU to peripheral device) 11 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL	E0	0	0 (leftside 4x6 dots for calendar)	
	E1		1	
	E2		2	
	E3		3	
	E4		4	
	E5		5	
	E6		6	
	E7		7	
	E8		8	
	E9		9	
	EA		■ (6x7 dots)	
	EB		▭ (for RSSI display)	
	EC		□	
	ED		▮ (5x7 dots)	
	EE		◀	
	EF		▶	
	F0	0	0. (Left side 4x6 dots	
	F1		1. +2x2 dots for calendar display)	
	F2		2.	
	F3		3.	
	F4		4.	
	F5		5.	
	F6		6.	
	F7		7.	
	F8		8.	
	F9		9.	
	FA		1 (Centre located 4x6 dots)	
	FB		2	
	FC		3	
	FD		A (Inverted A)	
	FE		a (Inverted a)	
	FF		1 (Inverted 1)	

Downward serial command (Main CPU to peripheral device) 12 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL Prior data = 08H DISPLAY CONTROL DIRECTIVE	00			
	01			
	02			
	03			
	04			
	05			
	06			
	07			
	08		8-LINE DISPLAY REQUEST	
	09		4-LINE DISPLAY REQUEST	
	0A			
	0B			
	0C			
	0D			
	0E			
	0F			
	10		SELECTIVE DISPLAY (1ST LINE)	
	11		(2ND LINE)	
	12		(3RD LINE)	
	13		(4TH LINE)	
	14		(5TH LINE)	
	15		(6TH LINE)	
	16		(7TH LINE)	
	17		(8TH LINE)	
	18			
	19			
	1A			
	1B			
	1C			
	1D			
	1E			
	1F			

Downward serial command (Main CPU to peripheral device) 13 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name		Remarks
04H DISPLAY CONTROL Prior data = 08H DISPLAY CONTROL DIRECTIVE	20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F		SELECT DISPLAY	(POSITION 0) (POSITION 1) (POSITION 2) (POSITION 3) (POSITION 4) (POSITION 5) (POSITION 6) (POSITION 7) (POSITION 8) (POSITION 9) (POSITION 10) (POSITION 11) (POSITION 12) (POSITION 13) (POSITION 14) (POSITION 15)	
	30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F		DISPLAY POSITION AUTO SHIFT ENABLE DISPLAY POSITION AUTO SHIFT DISPLAY		

Downward serial command (Main CPU to peripheral device) 14 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL Prior data = 08H DISPLAY CONTROL DIRECTIVE	40 41 42 43 45 46 47 48 49 4A 4B 4C 4D 4E 4F		WHOLE DISPLAY CLEAR WHOLE DISPLAY DISABLE WHOLE DISPLAY ENABLE WHOLE DISPLAY BLINK LINE CLEAR LINE DISABLE LINE ENABLE LINE BLINK CHARACTER BLINK (by space) CHARACTER BLINK (by ■)	 (Note 1) (Note 2) (Note 3)
	50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F			

Note 1: Two or more LINE BLINK can be transmitted in data portion of a command in order to flash plural lines.
Note 2: Two or more CHARACTER BLINK can be transmitted in the data portion of a command in order to flash plural characters

Downward serial command (Main CPU to peripheral device) 15 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
04H DISPLAY CONTROL Prior data =04H EXTENDED CHARACTER DEFINITION 1	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F		Ring (Mid. size) - English	(Note)
	10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F		Ring (Large size) - English	(Note)

Note: This command is valid only if it is possible to display this. As for character definition, the codes 0A04H to 0A0FH are used to generate the RING display of mid. size and the codes) 0A10H to 0A1FH are used to generate the RING display of large size.

Downward serial command (Main CPU to peripheral device) 16 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
08H CAR ADAPTER CONTROL	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F	4	INITIALISATION	(Note)
	10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F			

Note: The 2nd - 4th data byte of the INITIALISATION command indicates the sets of data for EVR in handsfree.

Downward serial command (Main CPU to peripheral device) 17 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
08H CAR ADAPTER CONTROL	20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F			
	30	1	HF Transmission Inhibit	
	31	1	HF Transmission Permit	
	32	1	Horn Alert ON	
	34	1	Horn Alert OFF	
	35	1	Radio Mute ON	
	36	1	Radio Mute OFF	
	37	1	DTMF Receiver ON	
	38	1	DTMF Receiver OFF	
	39	2	Voice Synth. ON	(Note)
	3A	1	Voice Synth. OFF	
	3B	2	Carrier ON with PL	
	3C	1	Carrier OFF	
	3D	3	HF Audio ON/OFF and A/L SW	
	3E			
	3F			

Note: This command is valid only if Voice Synth. Unit is mounted in H/F Cradle.

Downward serial command (Main CPU to peripheral device) 18 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
40H LOCAL CONTROL DATA (only KU)	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F	1	TRANSMISSION REQ. ACKNOWLEDGEMENT	
	10			
	11	3	LOCAL 1 (GLOBAL)	
	12	3	LOCAL 2 (GLOBAL)	
	13	3	CHARGE RATE	
	14	3	LOCAL	
	15 16 17 18 19 1A 1B 1C 1D 1E 1F			

Downward serial command (Main CPU to peripheral device) 19 of 19

Command ID	Data 1 (=Tr. Code)	Data Length	Command Name	Remarks
80H TEST DATA	00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F			
	10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F	1 N+1 1	ACK DATA NAK	 (Note)

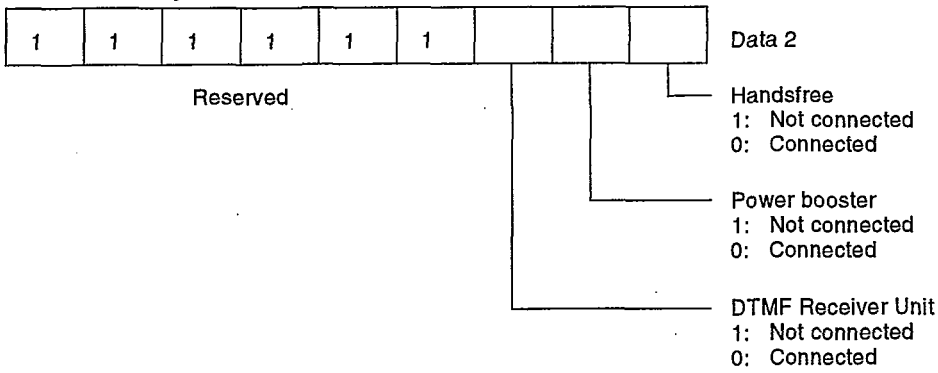
Note: The data byte length (N) is variable according to the command received.

3.3.5.2 Additional commands for the serial command

Upward serial command

1 INITIALISATION ACKNOWLEDGEMENT (CAR ADAPTER command)

This command is transmitted by the car adapter unit when it receives the INITIALISATION command.
The second byte of this command is shown as follows:



LOCAL CONTROL

The local command is transmitted by the local control adapter.
The second and the third data bytes are shown as follows:

1	1	1	1	I_7	I_6	I_5	I_4	Data 2
1	1	1	1	I_3	I_2	I_1	I_0	Data 3
	I_7	I_6	I_5			:		Order Qualifier
	I_4	I_3	I_2	I_1	I_0	:		Local

2 Upward serial command

AUDIO PATH

When the handset CPU receives the following audio path commands the following audio path commands, it set the audio path volume level as follows:

HANDS-FREE

The microphone, the speaker and the receiver are muted.

SPEAKER

The microphone and the receiver are muted and the speaker is unmuted.
The speaker volume is set to the level indicated in the command.

RECEIVER

The microphone and the receiver are unmuted.
The receiver volume is set to the level indicated in the command.

HANDSET 1

When in the OFF HOOK condition the speaker is muted and the microphone and the receiver are unmuted with the receiver volume set to the level indicated in the command.
When in the on hook condition the audio path is set to hands-free path.

HANDSET 2

When in the OFF HOOK condition the speaker is muted and the microphone and the receiver are unmuted with the receiver volume set to the level indicated in the command.
When in the on hook condition condition the audio path is set to speaker path.

INITIALISATION command (CAR ADAPTER command)
This command is transmitted by the main CPU. The 2nd - 4th data byte of this command is shown as follows:

	Data 2
	Data 3
	Data 4

Data 2: Tx centre volume

Data 3: Rx1 centre volume

Data 4: Rx2 centre volume

Carrier On with PL command (CAR ADAPTER command)
This command is transmitted by the main CPU. The second data byte of this command is shown as follows:

								Data 2

01H: Power Level 0
02H: Power Level 1
03H: Power Level 2
04H: Power Level 3
05H: Power Level 4
06H: Power Level 5
07H: Power Level 6
08H: Power Level 7

HF Audio ON/OFF with A/L SW command (CAR ADAPTER command)
The second and third data byte of this command is shown as follows:

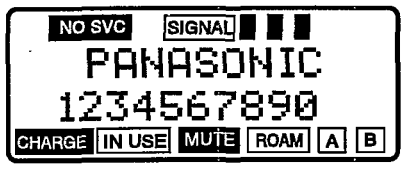
	Data 2
	Data 3

Data 2:
01H: A/L SW OFF
02H: A/L SW ON

Data 3:
01H: Rx/Tx Mute
02H: Rx Unmute/Tx Mute
03H: Rx Mute/Tx Unmute
04H: Rx/Tx Unmute

DISPLAY CONTROL
The display is shown as follows:

4 Line Display



1st line
2nd line
3rd line
4th line

Position 0 1 2 3 4 5 6 7 8 9 10 11

If the character is received when the display position auto shift function enabled the character is displayed on the current position and display position is shifted to the right. If the current display position is at the right end of the line the next position should be at the left end of the next line, but the current display position is at the right end of the bottom line the display position is not shifted.
Both BLINK command while the display is disabled and the DISABLED command while the display is flashing are ignored. The ENABLE command stops the the display flashing.

LOCAL CONTROL

LOCAL 1 (GLOBAL) and LOCAL 2 (GLOBAL) commands

The second and third data bytes are shown as follows:

I_{15}	I_{14}	I_{13}	I_{12}	I_{11}	I_{10}	I_9	I_8	Data 2
I_7	I_6	I_5	I_4	I_3	I_2	I_1	I_0	Data 3

I_{15} .... I_0 : Local control data

CHARGE RATE command

The second and third data bytes are shown as follows:

0	0	0	0	0	0	X	Y	Data 2
I_4	I_3	I_2	I_1	I_0	N_2	N_1	N_0	Data 3

LOCAL command

The second and third data bytes are shown as follows:

0	0	0	0	0	0	I_9	I_8	Data 2
I_7	I_6	I_5	I_4	I_3	I_2	I_1	I_0	Data 3

I_9 I_8 : 00: Control channel task
01: Waiting for order task
10: Waiting for answer task
11: Conversation task

I_7 I_6 I_5 : Order qualifier

I_4 I_3 I_2 I_1 I_0 : Local